Environmental Protection Agency Fuel Economy Label

Literature Review

United States Environmental Protection Agency

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

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Literature Review

Office of Transportation and Air Quality
U.S. Environmental Protection Agency

and

National Highway Traffic Safety Administration
United States Department of Transportation

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Table of Contents

Executive Summary

In 2006 EPA updated how the city and highway fuel economy values are calculated to better reflect typical real-world driving patterns and provide more realistic fuel economy estimates. In addition, EPA redesigned the fuel economy label to make it more informative for consumers. The redesigned label more prominently featured annual fuel cost information, provided contemporary and easy-to-use graphics for comparing the fuel economy of different vehicles, used clearer text, and included a web site reference to www.fueleconomy.gov which provided additional information.

EPA and the National Highway Traffic Safety Administration (NHTSA) are now initiating a new rulemaking to ensure that American consumers continue to have the most accurate, meaningful and useful information available to them when purchasing new vehicles and that the information is presented to them in clear and understandable terms. Further, the agencies must provide metrics that are relevant and useful for advanced technology vehicles such as plug-in hybrid electric vehicles (PHEVs).

To help inform the creation of the new label, as well as to inform an eventual public education campaign regarding fuel-efficient vehicles, EPA engaged PRR to work with them in the design and implementation of several information gathering protocols including:

- Literature review
- Focus groups (in 3 phases)
- National level online survey of new vehicle buyers
- Expert panel

This document presents findings from the literature review that PRR conducted. The primary focus of the review was to understand how consumers decide which vehicles to purchase and the factors that influence their decisions. This information will prove useful to informing the label redesign, as well as the planned educational campaign to assist consumers to identify more fuel-efficient vehicles.

PRR assembled and reviewed eighty articles pertaining to topics relevant to understanding the consumers' vehicle choice and purchase process. Of the eighty articles reviewed, fifty-five were included in this literature review report. (However, all eighty articles appear in the bibliography.)

Understanding How Consumers Choose Vehicles

Several factors were explored to help understand how consumers determine which vehicle to buy. These included the decision-making process and the sources of information and types of information they use. Also of interest were the impacts of such factors as reliability, safety, price, and fuel economy in the vehicle purchase process. The impacts of consumer demographics and psychographics were also noted in the review. Of growing importance is the availability of emerging technologies and fuels and how consumers weigh the cost, consumption, fuel source and environmental impacts of such vehicles against other factors. Literature addressing the importance of interactions between the vehicle dealers and consumers and how that impacts consumer satisfaction and loyalty was also reviewed.

The Vehicle Buying Cycle

The vehicle buying cycle is that period of time between consumers' first contemplation of purchasing a new vehicle and when they actually purchase the vehicle. For many consumers, purchasing a big-ticket item like a vehicle happens only occasionally and tends to be related to other major changes in their lives. This increases the anxiety level of the consumer and increases the need for good information to drive the decision process (Center for Advancing Health, 2009). With the dramatic increase in the type and amount of information available to consumers on the Internet, most consumers consider more alternatives and make decisions quicker

than ever (Center for Advancing Health, 2009). The vehicle buying cycle is contracting due to the amount of information that consumers are accessing on the Internet. By the time the consumer enters the dealership to test drive a vehicle s/he is closer to a final purchasing decision than was true in the past. The Internet also provides consumers the opportunity to purchase vehicles online (annual growth rate of 14.6% in the United States over the past five years) which is very attractive to consumers who do not want to negotiate with vehicle dealerships. Consequently, influencing consumer purchasing decisions increasingly needs to occur prior to consumers visiting dealer showrooms.

Sources of Information

Consumers gather information from a variety of sources as they work their way through the vehicle buying decision-making process. Traditionally, information has come from vehicle manufacturers and dealers, by word of mouth, and from family and friends, but much has changed with the advent of the Internet and the ability of consumers to search for information on specific types of vehicles and brands. Nearly half of consumers visit a vehicle manufacturer's Web site (Capgemini, 2009a), particularly in search of product and price information. Consumers are also increasingly using the Internet to access fuel economy information. The Internet also serves as a great source of information from those with first-hand experience with specific vehicles through reviews and blogs.

Factors Which Influence Vehicle Choice

Vehicle related factors

Consumers differentiate between different makes and models by what the vehicles have to offer, and make choices that maximize their utility when compared to other available makes and models of interest (Garcia, 2007). Even though there has been a tremendous growth in the number of vehicle makes and models and vehicle features, the most important factors that lead consumers to purchase a particular vehicle have remained consistent over time. According to Cars Online (Capgemini, 2009a, 2008, 2007), the top four factors that consumers continue to claim they value when making vehicle purchasing decisions are: reliability, safety, price, and fuel economy. This finding is in line with the Deloitte

(2008, 2010) survey findings wherein fuel economy and price were reported to be the most important vehicle attributes by consumers who were between the ages of 17 and 30 years.

Vehicle reliability influences consumers' experience and colors their opinion about the make and model of the vehicle, as well as the reliability and reputation of the brand (halo effect). No matter which vehicles consumers choose to buy, they have high expectations that the vehicle will be safe. In fact, many consumers are willing to pay more to obtain a vehicle with enhanced safety features. While the role of safety in consumers' decision process is yet to be explored in depth in research studies, both the government and manufacturers have acknowledged consumers' increasing need for safety in vehicles.

Vehicle price has become even more critical for consumers because of the global economic crisis, which has interested consumer interest in purchasing low-cost fuel-efficient cars (Capgemini, 2009a, 2008). Fuel economy has also become even more critical for consumers because of increasing gas prices. Further, fuel economy is the top reason why people are opting for fuel-efficient or alternate-fuel vehicles (Capgemini, 2009a, 2008). When gas prices go up and some feel the crunch in the operating costs of their current vehicle, they look for vehicles that have higher fuel efficiency.

Demographics

Vehicle purchasing decisions are influenced by consumers' specific needs and situations, but are also influenced by specific consumer demographics. Those demographics can include age, gender, income, education level, and household size. Each of these factors can influence what type of vehicle is likely to meet a consumer's needs. The studies reviewed showed that, not surprisingly, higher income families and individuals tend to drive more expensive vehicles, larger households tend to drive larger vehicles, and households are more likely to drive a minivan the more members are under the age of 19 (Choo & Mokhtarian, 2002).

Deloitte's 2008 Generation Y survey results found that in regards to fuel economy and environmental impact, those with lower personal or household income are more likely to rate gas mileage as an extremely or very important factor. Women attach more importance than men to gas mileage, storage capacity, and environmentally-

friendly production, while men tend to be more focused than women on leg room and horsepower. In addition, those who have attended college are more likely to say that thinking about the economic outlook and the relationship with oil-producing countries has a strong impact on their vehicle purchase decisions (Deloitte, 2008). Finally, concern for the environment, although important, is not important enough for most Gen Y consumers to pay a premium for a vehicle (Deloitte, 2010; Deloitte/MSU 2010).

Psychographics

In addition to demographics, psychographics also influence vehicle purchasing decisions. Psychographics are more about providing what consumers want than just providing something that they need (Assaraf, 2008). It's about what types of lifestyles they lead, what type of images they want to portray, how much and for what reasons they travel in their vehicles, and how they view their vehicles as an extension of self. Personality and lifestyle play a big part in what types of vehicles consumers choose to purchase and drive. It is also clear that by knowing more about a consumer's travel attitudes, personality, and lifestyle the better the prediction of the type of vehicle that will appeal to that consumer.

For example, when considering purchasing a vehicle, Gen Y consumers (age 17-28) indicated that (Deloitte, 2008):

- A vehicle says a lot about a person's taste/sense of style (82%)
- When buying a vehicle, I consider how it impacts my personal pursuit such as jobs, relationships, and hobbies (77%)
- When buying a vehicle, I consider how it reflects who I am as a person (67%)
- A vehicle says a lot about a person's status in society (65%)
- A vehicle says a lot about a person's values (57%)

Fuel-Efficient/Low Emission Vehicle Options

Consumer demand for green products is growing, and the automobile industry is no exception. There is growing awareness of fuel-efficient and alternative fuel vehicles, and consumer research indicates a growing interest in purchasing more fuel efficient and low emissions "greener" vehicles. While there is growing awareness of the environmental impact of the automobile, environmental concern typically shows up as a secondary factor and is not enough on its own to compel consumers to pay a premium in price or sacrifice performance for the sake of "being green." For green vehicles to gain widespread commercial acceptance, the cost and performance must at least match traditional vehicles.

In addition, while Generation Y drivers tend to understand the environmental benefits of "green" vehicles better than other age groups, many feel they lack the information to make good choices. They also are concerned about cost and tend to prefer vehicles that can provide both economic and environmental benefits.

A number of other barriers get in the way of consumers purchasing electric vehicles. These include: concerns about insufficient driving range, the need for specialized infrastructure (such as charging stations), battery performance, and doubts concerning the electric car's ecological value.

Importance of Interactions with Customers

Also important to a consumer's decision of what vehicle to purchase are the experiential factors that influence consumer loyalty to the dealer and/or brand, their satisfaction with the purchase, and their behavior after purchase. As the global auto industry struggles to deal with the economic downturn and American carmakers try to recuperate from a year full of bad news, maintaining a strong customer focus becomes essential for survival and good performance. As Accenture (2009) in their paper 'New Places, Faces and Spaces: Customer-centric principles for acquiring customers in today's multi-polar world' points out, the key to negotiating the extreme volatility of the present day market is to build customer loyalty to ensure long-term growth. This requires dealers to understand their current customer base, work hard to engage new customers, develop trust-based relationships with customers, and manage customer interactions and transactions efficiently. Good service and experiences build loyalty, which results in customers returning to the dealership for their next vehicle purchase.

Another part of this equation is the transformation of the customer-dealer relationship in recent times. With customers having access to all sorts of information from the Internet about the vehicles under consideration, they gain more of the power in the relationship than before. This creates a customer-dealer relationship that is more like an interaction between two equal parties. Further, consumers also read online reviews and rankings about other shoppers' experiences at the dealership and use these to determine what kind of experience they're going to have at a dealership.

Consumer Education Campaigns

The literature review did not find any academic studies on the results of education campaigns to encourage consumers to choose more environmentally friendly vehicles. Therefore, the focus of the information presented is on existing education campaigns, but not on their outcomes. For each campaign, a brief description of the campaign and a review of key outreach components are presented.

Conclusions

This literature review provides a summary of available information on the vehicle buying process, information sources used by consumers as they shop for vehicles, the factors that influence consumer vehicle purchasing decisions, and the impact of the increasing availability of "greener" vehicles. It also summarizes information on available public education campaigns that address the benefits of driving "greener" vehicles.

The sources used to prepare this literature review were varied in their methodologies and carried a variety of limitations as to their coverage of the population of U.S. car buyers. It should be noted that in spite of the multiple methods used by the major sources, a number of similar and consistent results and themes emerged from among them.

The following are a number of key findings that have implications for the redesign of the fuel economy label, as well as an educational campaign designed to aid consumers' understanding of more fuel-efficient vehicles.

- The length of the vehicle buying cycle is contracting as more and more consumers obtain more information sooner from the Internet. By the time consumers enter a dealership, many are closer to purchasing a vehicle than ever before. The Internet has emerged as one of the most important sources of information for consumers interested in purchasing a vehicle. To gather information consumers can visit manufacturer and dealer Web sites, and rely on consumer-to-consumer tools like reviews and blogs. Consumers are also increasingly interested in purchasing vehicles online. Consequently, information on the redesigned fuel economy label that is intended to inform them about a vehicle's performance in regard to several metrics (such as fuel consumption, cost, and environmental impact) should also be available online to assist consumers to find more fuel-efficient vehicles.

- Considering that in the consumer surveys reviewed consumers consistently stated that the most important factors that influence which vehicle they purchase are reliability, safety, price, and fuel economy (not necessarily in that order), the fuel economy label and educational campaign will need to acknowledge the place that fuel economy plays in the purchase process and identify ways to 'be heard' as consumers make their decisions.

- Consumer vehicle purchasing is also influenced by individual demographics and psychographics in terms of how a vehicle satisfies the practical and emotional needs of the consumer. Age, gender, income, household size, urban or suburban living, as well as availability of other travel options, all play a part in what type of vehicle a consumer decides to purchase. But so do the psychographic aspects of 'what a vehicle says about me.' This suggests that to be most effective, the educational campaign should be tailored to specific demographic market segments, while also making the purchase of fuel-efficient vehicles a 'cool' statement about the consumer. Acknowledging what is important in the vehicle purchase process to specific demographic segments, as well as to what consumers think of as 'cool', can serve as a gateway to getting their attention and assisting them to identify more fuel-efficient vehicles.

Finally, demographic and psychographic influences not only help in understanding the appeal of particular vehicles, but also point the way towards potential messaging to help consumers make better informed decisions.

- A major challenge will be explaining the functioning of advanced technology vehicles to consumers. Overall, consumers lack information on "green" vehicles and technologies to really understand the differences and be able to make comparisons across brands, models, and technologies. Identifying easy-to-understand ways to explain advanced technology vehicles, how they function, and the fuel-efficiency of such vehicles will need to be determined before an effective educational campaign can be designed. The redesigned fuel economy label will be an important starting point for this since it is being designed to effectively allow consumers to make informed comparisons among vehicle types.

- Lastly, the results of the literature regarding consumer education campaigns related to helping consumers better understand the benefits of purchasing a more environmentally friendly vehicle can serve as an important starting point for the agencies' educational campaign. Although it does not appear from the literature that these campaigns have evaluated outcomes, they can still provide good information, especially if key staff members from those campaigns are interviewed to learn about what worked and didn't work from their perspectives.

I. Introduction and Methodology

In 2006, EPA updated how the city and highway fuel economy values are calculated to better reflect typical real-world driving patterns and provide more realistic fuel economy estimates. In addition, EPA redesigned the fuel economy label to make it more informative for consumers. The redesigned label more prominently featured annual fuel cost information, provided contemporary and easy-to-use graphics for comparing the fuel economy of different vehicles, used clearer text, and included a web site reference to www.fueleconomy.gov which provided additional information.

EPA and the National Highway Traffic Safety Administration (NHTSA) are now initiating a new rulemaking to ensure that American consumers continue to have the most accurate, meaningful and useful information available to them when purchasing new vehicles and that the information is presented to them in clear and understandable terms. Further, the agencies must provide metrics that are relevant and useful for advanced technology vehicles such as plug-in hybrid electric vehicles (PHEVs).

To help inform the creation of the new label, as well as to inform an eventual public education campaign regarding fuel-efficient vehicles, EPA engaged PRR to work with them in the design and implementation of several information gathering protocols including:

- Literature review
- Focus groups (in 3 phases)
- National level online survey of new vehicle buyers
- Expert panel

This document presents findings from the literature review that PRR conducted. The primary focus of the review was to understand how consumers decide which vehicles to purchase and the factors that influence their decisions. All articles for this literature review were selected with that focus in mind. This information will prove useful to informing the label redesign, as well as the educational campaign to inform consumers about new vehicle technologies and how to use the fuel economy label to compare vehicles within and across technologies.

PRR assembled and reviewed eighty articles and studies to better understand how consumers decide which vehicle to purchase and what influences those purchasing decisions. Of most interest were those articles and studies that provided information from the viewpoint of the consumer. Because of the speed at which trends are evolving, most of the sources selected for inclusion were published between 1995 and 2010. The sources span a broad range of books, articles, papers, and secondary research reports. Data presented are primarily taken from business, marketing, and academic journals and magazines; Web sites; newspapers; conference proceedings; and published government guidelines, standards, and documents. From the eighty articles reviewed, fifty-five were included in this literature review report.

The major sources used in this literature review are summarized in Attachment 1 to this report. These summaries provide information on purpose, methodology, results and relevance to this literature review. As noted in Attachment 1, the sources used were based on varying methodologies. Also noted is that all sources are based on research from the U.S., except for the Capgemini studies which include information from a variety of countries. Even with their varying methodologies, several themes emerged that were consistent across many of the sources reviewed and are presented in the literature review. When appropriate, methodological limitations are noted in the text of this report and are also noted in Attachment 1.

This report was purposely written in a reader-friendly style that summarizes the key findings in a format that will be useful to a variety of audiences. In particular, the review provides the following information:

- Decision-making process used by consumers
- Sources of information and types of information consumers use to make their decisions:
  - Typical sources of information
  - Emergence of the Web as an important information source
  - New Web-based Consumer-to-Consumer tools and strategies
  - Online buying
- Factors that influence vehicle choice, including:
  - Vehicle specific factors such as reliability, safety, price, and fuel economy
  - Consumer demographic and psychographic influences on vehicle purchases
  - Availability of green vehicles and how consumers weigh the environmental advantages of purchasing green vehicles against all other factors they consider when deciding which vehicles to purchase
  - Importance of interactions between the vehicle dealers and consumers, and how that impacts consumer satisfaction and loyalty
- Education campaigns that have been used to encourage consumers to make more environmentally friendly choices when buying vehicles

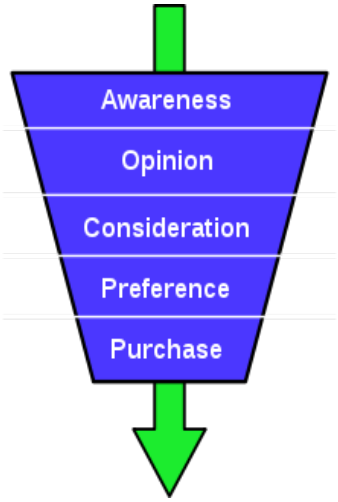
The APA citation style was used in this report to acknowledge the sources used in its preparation. The sources cited in the body of the report appear alphabetically at the end of the report (see Bibliography) and hyperlinks to full articles have been included for these sources in the bibliography for easy access and retrieval.

II. Understanding How Consumers Choose Vehicles

To better understand how consumers determine which vehicle to buy, a variety of factors were examined. The review started with the decision-making process used by consumers and the sources of information and types of information they use to make their decisions. The review then looked at the factors that influence vehicle choice including vehicle specific factors like reliability, safety, price, and fuel economy. Also considered was how individual consumer demographics and psychographics influence vehicle purchases. Of growing importance is the availability of green vehicles and how consumers weigh the environmental advantages of purchasing a green vehicle against all other factors they consider when deciding which vehicle to purchase. Lastly, the importance of interactions between the vehicle dealers and consumers and how that impacts consumer satisfaction and loyalty was considered.

A. The Vehicle Buying Process

The vehicle buying process is that time between when consumers first contemplate purchasing a new vehicle and when they actually purchase the vehicle. For many consumers purchasing a big-ticket item like a vehicle happens only occasionally and tends to be related to other major changes in their lives. The primary reasons that consumers start considering the purchase of a new vehicle are mechanical problems with their existing car, or the appeal of a new car or particular car feature (Capgemini, 2005). With the dramatic increase in the type and amount of information available to consumers on the Internet, most consumers consider more alternatives and make decisions quicker than ever.



In the past, studies have shown that the typical process used by consumers was composed of several distinct phases known as the purchasing funnel. First developed over a hundred years ago, the purchasing funnel is used to describe how consumers narrow choices as they move from awareness, to opinion, to consideration, to preference, to purchase. For vehicles, the purchasing funnel illustrates how consumers narrow their vehicle choices as they gather information and make judgments at each stage (Chatterjee, Jauchius, Kaas, Satpathy, 2002).

How consumers purchase vehicles has evolved with the increased use of the Internet to gather information about potential choices. Historically, consumers have started out considering six or seven different vehicles which they refine down over time to one or two vehicles they will go test drive (Clift, 2006). New studies by CNW Research have shown that about halfway through the decision process, consumers may add new vehicles for consideration as they are exposed to additional information through their searches on the Internet. Other important pieces of information available to new vehicle purchasers are reviews from current owners that may influence new vehicle buyer opinions and considerations (Clift, 2006). This creates a decision process that is not always as linear as that illustrated by the purchasing funnel. Although consumers may go back and forth among the steps of the purchasing funnel, it is clear that consumers must first be aware of the various vehicle options before they can form an opinion, and they must have a positive opinion of a vehicle option before they will consider it and decide to gather more information to narrow their choices to make a decision (Henry, 2008).

For many consumers, once they have narrowed their selection to a few vehicles, they visit a dealer with the intention of going for a test drive. Armed with additional information from the Internet (as well as other sources) before they enter an automotive dealership to look at and potentially test drive a vehicle, it is now more difficult than in the past to influence a consumer's decision on which vehicle they will ultimately purchase once they are at the dealership. Consumers are also able to more quickly reach a decision of whether or not to purchase a particular vehicle once they make the decision to take a test drive. They then gather additional information to make a final decision on which to purchase. At this point, other factors can influence the decision making process including vehicle pricing, the value of a trade-in, financing options, and how the consumer is treated by the dealership (Center for Advancing Health, 2009).

As the duration of the vehicle buying cycle contracts through the use of the Internet, automotive companies have less time to influence purchases. Based on results from its annual surveys of consumers interested in purchasing a new vehicle, Capgemini concluded that what used to take six months, may now only take four months. When a consumer is finally ready to visit a dealership, they are much closer to making a purchase than they likely were in the past. Consumers go to dealerships when they feel they have enough information on what they want to purchase and how much they want to pay to be able to negotiate. They gather more information through research on the Internet and visit fewer dealerships than in past years before making a vehicle purchase (Capgemini, 2009a). Based on a Capgemini's 2009 customer survey of 3,000 persons interested in buying a new vehicle, more than two-thirds of the respondents stated that they began gathering information two to four months before they planned to purchase a vehicle, and 60% visited a dealership for the first time within two months of purchasing a vehicle (Capgemini, 2009a).

The Internet also provides consumers the opportunity to purchase vehicles online which is very attractive to consumers who do not want to negotiate with vehicle dealerships. Online sales volumes have increased at an annual growth rate of 14.6% in the United States over the past five years (Deloitte, 2009). In a 2009 Capgemini consumer survey, 21% of U.S. consumers said they were likely to purchase a vehicle online. This is up from 17% the previous year (Capgemini, 2009a). Yet, online sales only represented represent 4% of total car sales in the United States in 2009 (Deloitte, 2009).

Price discounts, avoiding in-person interactions and price negotiations with a dealer, and ease and speed of the transaction were cited as the top reasons to purchase a vehicle online. The primary barrier to purchasing online cited by respondents is the inability to test drive a vehicle. Other barriers cited by respondents include not being able to see photos or video of the vehicle, inability to access accurate and complete product and pricing information, unsuitable interface to negotiate on pricing with dealers, concerns about delivery, and lack of integration with related services such as financing and insurance (Deloitte, 2010; Capgemini, 2009a). There is also strong interest in buying parts and accessories online, primarily as a means to find lower prices as an alternative to the traditional dealer model (Capgemini, 2009a). Overall, online buying is increasing, but it is unclear if there will be large scale adoption of the Internet as a sales channel.

B. Sources of Information

Consumers gather information from a variety of sources as they work their way through the vehicle buying decision-making process. Traditionally, information has come from vehicle manufacturers and dealers and by word of mouth. Much has changed with the advent of the Internet and the ability of consumers to search for information on specific types of vehicles and brands. The Internet also serves as a great source of information from those with first-hand experience with specific vehicles through reviews and blogs. Access to all this additional information has allowed consumers to make quicker and more informed decisions once they visit a dealership.

1. Typical Sources of Information

In the past, vehicle buyers relied on information from manufacturers, dealers, third-parties, classified ads, family and friends. More recently, vehicle buyers have started to gather information from the Internet (Center for Advancing Health, 2009). There is evidence that consumers gather information and conduct research prior to visiting vehicle dealerships (Nye, Greene, Hopson, and Saulsbury, 2003), although when particular types of information are accessed in the purchase process was not identified in the literature cited above. A 2009 consumer survey by Capgemini of more than 3,000 potential car buyers (consumers planning to purchase a car in the next twelve months) in eight countries revealed internet-based information sources were most popular with consumers in the United States and Western Europe, including dealer Web sites (52%), manufacturer Web sites (50%), search engines (48%), and information Web sites (42%). However, consumers still use and value more traditional sources of information, such as friends and family (45%), independent car valuation services (38%), manufacturer-specific franchise dealers (34%), and used car dealers (28%). Just 16% of consumers indicated they used television advertising and auto shows as information sources in the car-buying process (Capgemini, 2009a).

2. The Emergence of the Web as an Important Information Source

The Internet has become a standard information source for vehicle buyers. It has grown steadily over the past several years, from approximately 65% of U.S. consumers in 2005 using the Web to access vehicle information, to nearly 90% in 2009 (Capgemini, 2009a). The typical web usage pattern is that consumers start their research with search engines, then move to manufacturer and dealer sites, and finally to consumer-to-consumer (C2C) tools like web forums; blogs; RSS (Really Simple Syndication) feeds, which is a news and blog content syndication tool; and discussion sites (Capgemini, 2009a). New car buyers report spending nearly seven hours conducting online research to inform their decision: 47% of new vehicle buyers using the internet in the buying process visit an independent site when initiating the research for their new vehicle, and 46% visit a manufacturer website while conducting their online research (Center for Advancing Health, 2009).

It appears that consumers seek out the information sources that provide useful data on the attributes that they care about, and that those attributes of interest vary widely (Center for Advancing Health, 2009). The Centers for Advancing Health cites a J.D. Powers and Associates survey in which shoppers describe using independent, third-party sites such as Kelly Blue Book, Edmunds, and Consumer Reports for researching vehicle pricing, ratings, and reviews; manufacturer Web sites for information about vehicle model options, features, and specifications; and dealer sites for inventory information (Centers for Advancing Health, 2009).

Research conducted by the EPA in collaboration with PRR provides additional insight into where consumers obtain information on fuel economy. Thirty-two focus groups were conducted between February 25 and May 27, 2010 in the cities of Seattle, Chicago, Houston and Charlotte. The participants were asked to complete an online survey before they took part in the focus group discussions. The findings from this pre-group online survey indicated that two-thirds (67%) of the respondents used manufacturers' websites to search for information on fuel economy. The other sources that participants reported searching for fuel economy information were: fuel economy label on vehicles (60%), Consumer Reports (51%), Edmunds.com (31%), auto dealers (30%), asking those who had similar vehicles (29%), auto magazines (e.g., Car & Driver,

Road & Track, Motor Trend; 30%), Edmunds.com (30%), auto dealers (25%) and Government websites (e.g. fueleconomy.gov, EPA Green Vehicle Guide; 17%). The sources of information that were less popular included television ads (12%), environmental organizations (4%), newspapers (4%) and radio ads (2%). The survey also found that close to three-fourths (72%) considered EPA as a trusted source of information on fuel economy (PRR – Pre-Focus Group Online Survey Report, 2010).

The most important Web site features to consumers are price and product information, and the ability to compare vehicles. Consumers have consistently ranked these as the most important Web site features for several years. Less important Web site features include dynamic graphics, (such as video or eye-catching graphics), the ability to check dealer inventory, and online information about the latest ads and promotions (Capgemini, 2008, 2009a). While the use of the Internet does not appear to preclude consumer use of the dealer or word of mouth to gather information, there is some indication that consumers are substituting Internet research time for time spent at dealerships. In addition, print advertising is becoming less influential as the Internet becomes more useful and widely used (Center for Advancing Health, 2009; Capegemini, 2006, 2007).

It also appears that the presence or lack of desired Web site features can impact consumer buying decisions. For example, a 2008 Capgemini consumer survey of more than 3,100 car buyers in eight countries revealed that more than three-quarters of respondents said that "having the [web] features that matter to them would make them more likely to purchase a vehicle from that company," and "more than half said that if the features they care about are not available they would be less likely to buy from that company." This pattern was found to be consistent across all markets included in the survey (Capgemini, 2008).

Consumers increasingly use the Internet to access fuel economy information. Usage of the DOE and EPA Web site, www.fueleconomy.gov, increased from 400,000 user sessions in 1999 to more than 30 million user sessions in 2008. Based on web traffic, the four most popular features of the fueleconomy.gov website are: 1) Find-a-car, which allows consumers to compare up to four vehicles in terms of fuel economy, fuel cost, greenhouse gas emissions, and energy security; 2) "Your MPG," a feature that allows users to share real-

world MPG experience with others; 3) driving and maintenance tips to help drivers maximize fuel economy; and 4) MotorWeek Fuel Economy, which features public television programming to provide consumers with information about fuel economy and alternative fuel vehicles (Greene, Gibson, Hobson, 2009).

3. Importance of New Web-based Consumer-to-Consumer Tools and Strategies

Many consumers who use the Internet to gather information prior to going to a dealer showroom use consumer-to-consumer (C2C) tools after researching vehicles online with search engines and manufacturer and dealer Web sites (Capgemini, 2009a). C2C tools include automotive blogs, forums, discussion groups, video sites and RSS feeds, and allow consumers to gather supplemental qualitative information including consumer opinions on and reviews about specific car brands. Consumers also may use C2C tools to engage in a two-way dialogue with automotive experts and other consumers and to receive news about new vehicles and information about vehicle recalls (Capgemini, 2008, 2009a).

Interestingly, a 2009 Deloitte survey of 1,100 Gen Y consumers (randomly drawn from a panel of individuals who agreed to participate in online surveys) found that the majority of Gen Y consumers (64%) do not get their information on a vehicle brand or model from social networking sites, despite this group's high rate of social media use for general communication. Further, more than half (58.2%) do not look for vehicle advice on blogs or other social media forums. Instead, the majority (79.9%) rely on search engines such as Google or Yahoo! for information on a specific vehicle (Deloitte, 2010).

However, there is some evidence that C2C tools may influence buying decisions. A 2009 Capgemini consumer survey revealed that more than two-thirds of consumers said they would be more likely to purchase a particular vehicle or buy from a certain dealer if they found positive comments posted on blogs and web forums about the vehicle or dealer. In addition, approximately 57% of respondents said they would be less likely to buy a particular make or from a specific dealer if they found negative comments on these kinds of sites (Capgemini, 2009a).

4. Green Car Labeling

While the Internet is one resource consumers are increasingly using to look for fuel economy estimates when researching and comparing vehicles, well designed eco-labels can also be useful in providing fuel economy information to consumers (Teisl & Rubin, 2008). In addition, participants in focus groups conducted in Maine in 2004 stated that they get much of their information on vehicles on-line, and while they would like to have more information about environmental factors on the vehicle label, most had made their vehicle purchasing decision before they visited a dealership and were exposed to eco-labeling on the vehicle (Teisl & Rubin, 2004). In their "Green Car Labeling" study, Northeast States for Coordinated Air Use Management (2003) interviewed 658 individuals 25 years or older that lived in the Northeast region of the U.S who had purchased a vehicle in the last two years, or planned to purchase a vehicle in the next two years. They found that one-half of these individuals thought that knowing about vehicle emissions was highly important when purchasing a vehicle. In addition, four out of 10 of these individuals stated that if the information was readily available, they would be highly likely to consider emissions in their next vehicle purchase. A key finding from this study was that the importance of emissions in their vehicle purchasing decision increased when emissions information was available, with three-quarters of the people interviewed stating they were in favor of green car labeling and that they would be moderately or highly likely to use the information on the label in their next vehicle purchase.

C. Factors Which Influence Vehicle Choice

1. Vehicle-related factors

As Garcia (2007) has pointed out, automobiles have traditionally been thought of as bundles of attributes desired by consumers. Consumers tend to differentiate between different makes and models by the various attributes they offer. They make choices among various makes and models to maximize their utility by choosing the make and model considered superior compared to all other available choices.

Even though there has been a tremendous growth in the number of vehicle makes and models that offer a plethora of vehicle-attribute combinations to consumers, the most important factors that lead consumers to purchase a particular vehicle have remained consistent over time. According to Cars Online (Capgemini, 2009a, 2008, 2007), reliability, safety, price, and fuel economy (not necessarily in that order) are the top four factors that consumers have consistently stated they focus on when it comes to making their final decision about which vehicle to buy.

a. Vehicle reliability and reliability of brand

The value that reliability plays to both manufacturers and consumers is of interest to both consumer researchers and practitioners. In general, consumers consider a vehicle to be reliable if it is likely to have fewer problems than other vehicles even as it ages (Consumer Report, 2010). Vehicle reliability has been found to have a positive impact on the consumers' likelihood of choosing a vehicle (Woods, 2010; Scordo, 2009; Dangol, Jitpaiboon & Walters, 2007; Train & Winston, 2007). The benefits that consumers see in buying a vehicle with high reliability include lower costs of repair and higher resale value. Therefore, consumers are likely to be concerned about vehicle reliability when researching their upcoming vehicle purchase (BuyingAdvice.com, 2007).

While reliability in simple terms may be thought of as how well a vehicle is likely to run without expensive maintenance and repair over time, it has far reaching impacts on brand reputation. Based on how reliable consumers consider the vehicle model to be, a brand halo kicks in whereby consumers build opinions about the vehicle make, brand reliability and manufacturer's reputation. Such a halo effect can have serious positive implications for consumers' future vehicle purchase. A recent research study by Capgemini (2009a) found that an increasing number of consumers were growing brand loyal and were more likely to purchase the same make/brand as their current vehicle.

Research has found that because a new vehicle's reliability is not available at the point of purchase, the reliability history of the model (measured based on the number of repairs reported by the owners of such model), and brand reputation play an important role in consumers' evaluation of a new vehicle (Betts & Taran, 2004). Further, when such a reputation is backed by trusted and

widely-cited publications such as Consumer Reports, Edmunds publications and other reviews, it has a major impact on consumers with regard to their purchase decision (Train & Winston, 2007; Betts & Taran, 2004). For example, foreign automakers have developed a reputation for building highly reliable cars as compared to American carmakers (Woods, 2010; Dangol, Jitpaiboon & Walters, 2007; Train & Winston, 2006; Nichols & Fournier, 1999). This has resulted in the declining market share of U.S. automakers who have not gained the reputation for improved vehicle reliability as compared to Japanese and European manufacturers (BuyingAdvice.com, 2007; Train & Winston, 2006).

b. Safety

Consumers also continue say that they consider safety to be one of the most important considerations in buying a new or used vehicle (Consumer Reports, 2010, 2008; Capgemini, 2009a, 2008, 2007, 2006; Deloitte, 2008; BuyingAdvice.com, 2007) and research vehicle safety performance ratings before purchasing a vehicle (Harris, 2001). In addition, consumers say that they are increasingly seeking safety features in their vehicles (Deloitte, 2010) and are willing to pay more for a vehicle to obtain improved safety levels (Harris, 2001). A U.S. national automotive consumer study of 2,160 respondents (who qualified as future new or used vehicle buyers) in 2003 (TRW Automotive, 2003) found that consumers had progressively increased their rating of the importance of safety features such as smart airbags, vehicle stability control and anti-rollover systems as compared to how they rated safety systems in 1998. Further, findings from a recent Deloitte survey (Deloitte, 2009) based on 991 U.S.-based Deloitte U.S. employees[1] indicated that U.S consumers are willing to pay a premium for safety features and options such as skid control, telematics, safety devices (such as back-up sensing systems, electro-chromatic mirror/auto dimming mirrors, energy-absorbing steering system, head restraints, padded kneed bolster, etc.), and blind spot mirrors. The Deloitte study also predicted that the current economic crisis will leave customers to value vehicle safety more than before and seek vehicles with enhanced safety features.

Consumers' increasing demand for safety has led manufacturers to think and develop safety-related innovations and features (such as automatic crash notification, emergency assistance, and remote vehicle diagnostics) in their recent models (Deloitte, 2009;

1 Because the study was based on a convenience sample of Deloitte U.S. employees, it may not be representative of the U.S. auto consumer population. Further, it should be noted that intended behavior (i.e., consumers' willingness to pay more for safety features) may not necessarily translate into actual purchase behavior.

Dannenberg & Burgard, 2007). Yet, due to cost, many vehicle safety improvements were not universally implemented until mandated by the U.S. National Highway Traffic Safety Administration (NHTSA). Most recently, NHTSA has introduced a proposal to mandate Electronic Stability Control (ESC) on all passenger vehicles by the 2012 model year (Consumer Reports, 2009). According to NHTSA (2010), ESC will reduce single-vehicle crashes of passenger cars by 34% and single vehicle crashes of sport utility vehicles (SUVs) by 59%, with a much greater reduction of rollover crashes. NHTSA also estimated that ESC will save 5,300 to 9,600 lives and prevent 156,000 to 238,000 injuries in all types of crashes annually once all light vehicles on the road are equipped with ESC.

c. Vehicle price

Vehicle price is also one of the top considerations that heavily impact consumers' vehicle purchasing decisions (Deloitte, 2009, 2008; Capgemini, 2009a, 2008; Consumer Reports, 2009). In most cases, consumers want to buy a vehicle that they can afford without compromising much on other important factors such as reliability and safety. They also want a vehicle that fulfills their emotional and functional needs. For example, people are drawn to the BMW as "the ultimate driving machine," though they may choose a model with a small engine and automatic transmission. While previous research has shown that consumers do not always seek the absolute lowest price while purchasing a vehicle (Root, 2008), it is important to remember that the current economic crisis has impacted consumer behavior with regard to vehicle pricing.

Vehicle price has become even more important than before the onset of the global recession. Based on a recent survey, Deloitte (2009) predicts a critical shift in auto consumers' purchase priorities as customers seek value in the form of cheaper and more efficient vehicles. While research is yet to substantiate such a shift, recent studies have found another significant shift with regard to vehicle price. Consumers are increasingly using the Internet to search for vehicle pricing information (Consumer Reports, 2009) and are wanting to buy new vehicles online as an alternative to the traditional dealer model (Capgemini, 2009a).

Research has also shown that the Internet has lowered vehicle prices by informing consumers about dealer invoice prices and thereby enabled consumers to negotiate lower prices (Zettelmeyer, Morton & Silva-Risso, 2005).

d. Fuel economy

Research has shown that fuel economy is one of the top factors that consumers report influence which vehicle they choose (Deloitte, 2009, 2010; Capgemini, 2009a, 2008, 2007). It has become even more critical in the minds of U.S. consumers in their final vehicle purchase decisions because of the volatile changes in gasoline prices in 2007 and 2008 (Deloitte, 2008; Capgemini, 2008).

Not surprisingly, concern about fuel prices has resulted in consumers' increased interest in more fuel-efficient or alternative-fueled cars. Research studies by Capgemini (2009a, 2008, 2007) have found that more than environmental concerns, fuel economy is the leading driver behind consumers buying fuel-efficient or alternative-fuel vehicles, with 83% of respondents reporting fuel economy was important/very important in 2007. This figure rose to 90% in the 2008 and 2009 surveys. Studies further found that women, lower income households, younger consumers, non-white purchasers, and buyers in more densely populated areas attached more importance to fuel efficiency in vehicles compared to others (Deloitte,2008; McCarthy & Tay, 1999).

While fuel economy has been discussed in the past (especially during times of decreased fuel availability such as during the oil crisis of 1973), only a few studies have attempted to explore it in depth. In one such study, based on interviews with 57 U.S. households, Turrentine & Kurrani (2006) attempted to determine how U.S. consumers think and behave with respect to automotive fuel economy. They found that there is no systematic way in which auto consumers analyze fuel economy in their automobile or gasoline purchases. Most consumers simply look at the cost of their last tank of gas and the unit price of gas on that day, and then forget it. As a result, they do not optimize their fuel economy decisions, and make large errors when asked to estimate their gasoline costs and savings over time.

As the price of gasoline increases, consumers feel the impact on the operating cost of their vehicle and look for vehicles that meet higher fuel efficiency standards. The more the consumers are concerned about fuel efficiency, the more they search for vehicles that meet their expected fuel economy expectations (McCarthy & Tay, 1999).

In addition, there is a body of research that uses vehicle choice modeling to help determine the role of fuel economy in consumer vehicle purchasing decisions. In Helfand and Wolverton's 2009 review of this research, they determined that while this modeling is a valuable tool for regulators, there are wide variations in how these studies estimate the value that consumers place on fuel economy, that consumers tend to under-value the benefits of greater fuel economy and that consumer willingness to pay for fuel economy does not equal the expected value of the fuel savings. They conclude that more research is needed on how to model the role of fuel economy on consumer vehicle purchasing decisions (Helfand & Wolverton, 2009).

e. Other vehicle related factors

Apart from the above discussed factors, studies have documented other factors that influence consumers' vehicle purchase decisions.

In their 2007 survey, based on 2,600 consumers across five countries (United States China, France, Germany, and United Kingdom), Capgemini documented the following factors as being very important to consumers in their vehicle purchase decisions. Ranked in order of stated importance: reliability of brand, safety, price of vehicle, fuel economy, quality of interior/style, after-sales service, brand name of vehicle, products and services, extra options at no extra cost, vehicle availability, sales/delivery date, trade-in value, environmental factors, product/feature options, ability to research information on Internet, 0% or low financing, additional warranty coverage/service credit, and cash-back incentives. As a follow-up, Capgemini conducted surveys in 2008 (with 3,100 consumers across eight countries- United States, Brazil, China, France, Germany, India, Russia, and United Kingdom) and 2009 (with 3,000 consumers across the same eight countries) with similar results, although there were some minor changes in the order in which these factors were rated by respondents. A few novel factors did emerge as important in these two surveys, including 'Hybrid or other alternative-fuel cars' (in the 2008 survey as well as the 2009 survey), treatment by the manufacturer during my previous ownership cycle (in the 2009 survey) and treatment by the dealer during my previous ownership cycle (in the 2009 survey). The 2008 and 2009 surveys revealed that consumers in developing markets (Brazil, China, India, and Russia) were more likely than consumers in mature markets (France, Germany, United States, and United Kingdom) to rate factors such as additional warranty coverage, cash-back incentives, and product feature options as important factors in choosing a vehicle.

In their 2008 Generation Y study, (based on a random sample survey of 1,006 people between the ages of 17 and 28), Deloitte reported the following factors to be the most important in vehicle purchase decisions (in order ranked most important): gas mileage, affordability, performance, leg room, exterior styling, low emissions, quiet interior, storage, interior look, 'company is a good corporate citizen', technology, intelligent settings, wheels, horsepower, environment-friendly factory, manual transmission, and latest model on the market.

As a follow-up to their 2008 survey, Deloitte (Deloitte, 2010) conducted another survey (based on a similar random sample survey of 1,100 people between the ages of 18 and 30 years). This survey found the following factors to be the top factors that were critical to respondents' vehicle purchase decisions (in order ranked most frequently): gas mileage, affordability, exterior styling, interior room, power locks and windows, air conditioning/heat, safety, CD player, reliability, and automatic transmission.

2. The Role of Demographics in Vehicle Purchasing

Vehicle purchasing decisions are influenced by consumers' specific needs, situations and demographics. Those demographics can include age, gender, income, education level, and household size. This section presents three examples of how these factors might affect vehicle purchases. While they may not be indicative of how the overall population makes vehicle purchasing decisions, they do show how demographics can influence people's decisions.

a. Demographics and vehicle type

One large study (Choo & Mokhtarian, 2002), based on a randomly selected mail survey of 1,904 residents in three neighborhoods in the San Francisco area, provides some interesting insights into what types of consumers drive what types of vehicles. The neighborhoods covered by this survey were both urban and suburban and included a variety of ages, income levels, and household sizes. The survey specifically asked individuals about the vehicle they primarily drive.

It found that with all other things being equal, the more a vehicle costs, the less likely it is to be purchased. It also found that higher income families and individuals are more likely to drive more expensive vehicles such as luxury cars and SUVs. In addition, the

more members there are in a particular household, the more likely that household will drive a larger car. In fact, the greater the number of people under the age of 19 in a household the more likely that household is to drive a minivan. Yet, there were also some large households with lower incomes that drive small cars.

In terms of age, younger drivers are more likely to drive a small car, a sports car, or an SUV. Drivers over the age of 65 are more likely to drive a larger luxury car than any other vehicle type. Homemakers and retired people tend to drive larger more comfortable cars like minivans or luxury cars. In general, pickups and large cars tend to be driven by less educated drivers, and females are less likely to drive pickups than any other vehicle type. Those that live in urban settings are more likely to drive small and luxury cars.

b. What about Generation Y?

Much recent research has been conducted by Deloitte on Generation Y consumers. This includes those individuals born in the late 1970s and the 1980s. People included in this generation have lived their entire lives during the environmental movement and with availability of personal computers. Much of this research is trying to address how this particular age group views sustainability and gathers information when it comes to purchasing a vehicle.

One study partially based on this data (Deloitte, 2010) found that Generation Y says they consider the impact of their purchases on the environment when shopping for a vehicle. However, many stated that were not willing to pay a premium for a more environmentally friendly vehicle. Therefore, to be successful, manufacturers must provide both an economic and environmental value for Generation Y consumers to adopt emerging sustainable technologies. Additional findings based on these survey results (Deloitte, 2008) found that respondents with lower personal or household income were more likely to rate gas mileage as an extremely or very important factor. Women attached more importance than men to gas mileage, storage capacity, and environmentally-friendly production, while men were more focused than women on leg room and horsepower. In addition, those who had attended college were more likely to say that thinking about the economic outlook and the U.S. relationship with oil-producing countries had a strong impact on their purchase decisions.

From Deloitte's 2009 survey (Deloitte, 2010), respondents indicated that the top three options or features that a vehicle must have and

are "critical to your vehicle purchase decision" were: gas mileage, affordability/price, and exterior styling/looks. The respondents also had some strong feelings about the end of the purchasing process and a majority stated that they would prefer to test drive a vehicle for 24 hours (69%), know the final price upfront (85%), purchase the vehicle without negotiating with a salesperson (60%), and not have to haggle over the price of the car (62%).

c. Needs of older drivers

Based on U.S. Census data, in 2005 there were 50 million people aged 60 and above, and it's estimated that that amount will increase to 75 million by 2020. That translates into one in five people being age 60 and above by 2020. This group also has the greatest amount of disposable income of any age group. To appeal to this group, products need to be designed to address their changing physical needs (Deloitte, 2005). For example, when Ford realized that driver fatality rates were higher for drivers past 50, they decided to design cars that increase occupant safety for older drivers including crash avoidance, crashworthiness, and post crash assistance. To help them understand the physical limitations and experiences of older drivers they designed the Third Age Suit, which engineers can use to evaluate mobility strength and vision limitations of someone 50 years and older. The suit adds bulk, restricts movement, and includes goggles that simulate cataracts. Based on their results, Ford is designing and building vehicles for aging customers (Deloitte, 2005).

3. The Role of Psychographics in Vehicle Purchasing

In purchasing a vehicle, psychographics help explain how vehicles satisfy the emotional needs of the consumers, not just the practical needs. It's about what type of lifestyle you lead, what type of image you want to portray, how much and for what reasons you travel in the vehicle, and how you view the vehicle as an extension of yourself (Assaraf, 2008). This section presents examples of how psychographics can influence vehicle purchasing decisions.

a. How travel attitude, personality, and lifestyle influence vehicle type in the San Francisco Bay Area

A study (Choo & Mokhtarian, 2002) based on a randomly selected mail survey of 1,904 residents in three neighborhoods in the San Francisco area specifically looked at how travel attitude, personality, lifestyle, and mobility factors influence individual vehicle choice. The results of the study were then used to develop a choice model based on these factors as well as typical demographic variables.

The study presents six descriptive attitude clusters for the sampled area:

- **Affluent professionals** - affluent and mobile. This cluster eats out a lot, is not family and community oriented and usually doesn't have a large family. They seem to be more entertainment oriented than work oriented.

- **Transit-using urbanites** - Young, urban, highly educated and community oriented. This cluster is pro-environment and pro-high density (they live in urban areas and like it).

- **Homemakers and older workers** - Older suburanites who focus on family and home and don't particularly like travel.

- **Travel haters** – This work-oriented cluster doesn't like travel, does as little travel as possible and wants to do less of it.

- **Excess travelers** - Young, urban, highly educated and adventure seeking. This cluster is pro-environment and pro-high density, and pro-travel. Not one of the highest income groups, perhaps because they are prioritizing their adventure time over work time and status-seeking.

- **Adventurous and car-oriented suburbanites** – Car-bound, excess travelers, oldest, organized, status conscious, and suburban.

In addition, the study presents eleven descriptive personality and lifestyle clusters including:

- **New family model** – Young families, enjoy traveling for fun, but not for work, family/community oriented, but not settling down.
- **Homebodies** - Not particularly social, don't really like to travel, one of the more neutral in attitudes toward travel clusters compared to others.
- **Mobile yuppies** – Young, professional, highly educated, travel lovers.
- **Transit advocates** – Highly educated, environmentally sensitive, transit oriented.
- **Assistant VPs** – Suburban, auto-oriented (but not particularly travel loving), older, least educated, frustrated (meaning they feel less in control and less satisfied with their lives).
- **Status seeking workaholics** - Travel most (miles and frequency) for work, auto-bound, enjoy work travel. One of the most extreme clusters in regard to attitudes toward travel. Most status seeking, workaholic and not calm.
- **Suburban and stationary** – Mostly older, suburban women, calm, don't travel a lot.
- **Older and independent** – Older, independent, unencumbered (most strongly NOT family/community oriented), entertainment focused.
- **Middle-of-the-roaders** – Most neutral cluster in regard to travel attitudes, most strongly family/community oriented.
- **Travel loving transit users** – Highly educated urban women, middle income, environmentally sensitive, like short distance travel by bus, strong excess travelers, highest walking share of total miles traveled.

- **Frustrated loners** – Most extremely frustrated (group with highest level of frustration with their lives), above average commutes, somewhat transit oriented (Choo & Mokhtarian, 2002).

The study analyzed vehicle type in relation to these attitude, personality, and lifestyle clusters. All vehicle types, except the mid-sized car group, have distinct characteristics:

- *Small car* drivers are pro-environment, tend to live in high density areas, and do not have a strong travel freedom attitude. They tend to be loners and perceive themselves as traveling less in a personal vehicle than others. They are also less likely to enjoy personal vehicle travel. They tend to be female, 40 or younger, have 4-year college degrees, and are in clerical or professional jobs. They live in single vehicle and single adult households. Higher proportion of Transit-using Urbanites, Excess Travelers, Transit Advocates, Travel Loving Users, and Frustrated Loners clusters.

- *Compact car* drivers have a weaker travel freedom attitude and travel less in their personal vehicles for long-distance trips. They tend to perceive themselves as traveling less by personal vehicles than others. Like small car drivers, they have higher proportions of professional jobs, and single vehicle and single adult households. They have middle incomes. Higher proportion of Affluent Professionals, Transit Advocates, and Suburban and Stationary clusters.

- *Mid-sized car* drivers have no distinct travel attitude, personality, lifestyle, mobility, or travel liking characteristics. Demographically they are more likely to be females or homemakers, and to have higher incomes or larger households. Higher proportion of Affluent Professionals, Assistant VPs, and Middle-of-the-roaders clusters.

- *Large car* drivers tend to not have pro-environmental or pro-high density attitudes. They tend to be males, older or retired, and part-time employees. They also tend to be less educated and have lower incomes. They have more than one vehicle, and tend to be older households. Higher

proportion of Homemakers and Older Workers, Travel Haters, and Adventurous, Car-oriented Suburbanites, and higher than average proportions of Homebodies, Assistant VPs, Middle-of-the-roaders, and Frustrated Loners clusters.

- *Luxury car* drivers are more likely to be status seekers and to often travel long distances by plane. They are more likely to be male and older or retired. They are highly educated and higher income people. They have more than one car and live in older adult households. Higher proportion of: Travel Haters, Excess Travelers, New Family Model, Status Seeking Workaholics, and Older and Independent clusters.

- *Sports car* drivers are more likely to be adventure seekers. They are more likely than average to have 4-year college degrees and lower incomes. They live in two-worker or younger adult households. Higher proportion of: Excess Travelers, New Family model, Mobile Yuppies, Status Seeking Workaholics, and Frustrated Loners clusters.

- *Minivan/Van* drivers have a weak pro-high density attitude. They perceive that they travel more by personal vehicle than do others. They enjoy traveling by personal vehicle more than average. They tend to be females and homemakers between the ages of 41 and 64. Both higher and lower household incomes are represented. They have more than one vehicle and larger households with children. Overrepresented in Homemakers and Older Workers, and Adventurous, Car-oriented Suburbanites; and higher than average proportions of Homebodies, Suburban and Stationary, Middle-of-the-roaders, and Travel Loving Transit Users clusters.

- *Pickup* drivers have a weaker pro-high density attitude. Their short-distance travel is higher than average, while long-distance travel by airplane is lower. They tend to have lower education levels, are full-time employees in service-related jobs, have middle incomes and two-vehicle households. Higher proportions of: Homemakers and Older Workers, Adventurous, Car-oriented Suburbanites, New Family Model, and Assistant VPs clusters.

- *SUV* drivers tend to have a strong travel freedom attitude and enjoy traveling short-distances by personal vehicle. They are likely to be age 40 or younger and are highly educated or high income people. They have a higher than average proportion of larger households with children. Higher proportions of: Adventurous, Car-oriented Suburbanites, New Family Model, Mobile Yuppies, and Older and Independent clusters.

Based on these results, the authors concluded that travel attitudes, personality, lifestyle, and mobility factors do affect individual vehicle type choices. In regards to attitudes that are pro-environment, those clusters that are pro-environment are those that use transit and tend to drive smaller cars. They tend to be more affluent and more highly educated and community oriented. The authors' conclusions are based on based on a randomly selected mail survey of 1,904 residents in three neighborhoods in the San Francisco area and while they provide interesting insights into how psychographics can influence which vehicles consumers chose to purchase and drive, they are not representative of the overall U.S. population. (Choo & Mokhtarian, 2002).

b. Views of Generation Y

Deloitte's 2008 survey of Generation Y, found that a majority of the respondents felt that a vehicle reflects a person's style, status and values, but that when considering the purchase of a new car, the underlying qualifications were always safety and comfort. Specifically, the study found that "roughly two-thirds of the respondents strongly or somewhat agreed that a vehicle reflects a person's taste and status and they consider these factors when making a purchase decision." This conclusion was based the results of those that somewhat or strongly agreed to the following statements:

- A vehicle says a lot about a person's taste/sense of style (82%)

- When buying a vehicle, I consider how it impacts my personal pursuit such as jobs, relationships, and hobbies (77%)

- When buying a vehicle, I consider how it reflects who I am as a person (67%)

- A vehicle says a lot about a person's status in society (i.e. importance or wealth) (65%)

- A vehicle says a lot about a person's values (57%)

When considering purchasing a vehicle, this group responded that the most important factors are: gas mileage (92%), affordability (91%), performance (90%), leg room (65%), exterior styling (65%), and low emissions (58%). However, for this group environmental friendliness plays an increasing role in their perception of what is 'cool' in terms of what they drive. The respondents gave as their top four reasons that a vehicle is considered 'cool' to be: its exterior styling (44%), affordability (40%), being environmentally friendly (35%), and comfort (33%). Based on these results, Deloitte concluded that for Generation Y, environmental friendliness is playing an increasing role in their perception of cool. Additionally, when asked what broader issues they considered when purchasing a new vehicle, 62% responded they considered the environment, and 80% of that 62% also responded that they were willing to pay more for an environmental friendly vehicle (Deloitte, 2008).

c. Vehicle choice is often based on emotions

Based on the results of their 2006 and 2007 surveys, Capgemini concluded that consumers are increasingly driven by their hearts as well as their heads. They found that although rational factors such as safety, price, and reliability play a role in consumer decisions, these factors are often overlooked by other more emotional factors. For example, when respondents were asked why they had or were going to switch vehicles, "fits my needs," "wanted to try something new," and "enjoyment of the vehicle" scored higher than fuel economy and safety. To be successful, manufacturers and dealers have to appeal to both rational and emotional aspects of vehicle buying.

People buy vehicles to make a statement about their personality and become emotionally attached to their vehicles. In addition, vehicles can say a great deal about the people who drive them. For example, the main reason that consumers reported buying one leading hybrid vehicle was not because of fuel economy or low emissions, but because they saw the car as making 'a statement about me.' This was especially the case since this particular vehicle was only available as a hybrid and so driving it made a clear statement about the driver's priorities. Also important to consumer decision-making

are the influences of social norms and the behaviors of those around us. What others around us drive may influence what we choose to drive and what we view as acceptable to drive (European Commission, 2009).

4. Fuel-Efficient/Low Emission Vehicle Options

Consumer demand for green products is growing, and the automobile industry is no exception. There is growing awareness of fuel-efficient and alternative fuel vehicles, and consumer research indicates a growing interest in purchasing more fuel efficient and low emissions "greener" vehicles. In a 2009 study of consumers in eight countries (United States, Brazil, China, France, Germany, India, Russia, and United Kingdom) 41% of respondents reported currently owning a fuel-efficient or alternative-fuel vehicle, up from 36% in the prior year's survey. Another 30% of consumers plan to buy a fuel-efficient or alternative fuel vehicle (Capgemini, 2009a).

The main technologies available for green vehicles include alternative fuels (which include compressed natural gas, second-generation bio-fuels, and hydrogen), advanced internal-combustion-engine (ICE) technologies, and fully electric vehicles (The Boston Consulting Group, 2009). One view is that hybrids are serving as a transition technology that will aid in the switch to electric vehicles and that while hybrids will still outnumber electric vehicles in the year 2020, trends point to a fully electric long-term future (Deloitte, 2009). Others see more promise in the development of alternative power-train technologies such as advanced internal combustion engine technologies (ICE) and electric as more promising technologies than alternative fuels due to the significant investment and further technological progress needed to achieve substantial reductions in alternative fuel CO2 emissions (The Boston Consulting Group, 2009). However, there is some indication that natural gas could become an important part of the domestic fuel supply, especially for fleets (Deloitte, 2009).

a. Reasons for buying fuel efficient/low emission 'green' vehicles

Despite increasing demand for greener purchase alternatives and growing awareness of the environmental impact of automobile use, consumer research shows that fuel savings is the primary factor influencing decisions to purchase green vehicle with concern about environmental impacts showing up as a secondary factor (Ernst and

Young, 2010; Capgemini, 2009a; Capgemini, 2008; Capgemini, 2007). This finding is echoed in focus group research conducted in Knoxville and Los Angeles with consumers who were in the market for a new or used vehicle. The focus group participants indicated that with the exception of fuel economy, environmental concerns were not a factor in participants' decision-making process when purchasing a vehicle, and those who do consider fuel economy do so primarily for economic rather than environmental reasons (Nye, Greene, Hopson, Saulsbury, 2003).

There is some evidence that concern for environmental impacts has a growing influence on vehicle purchase decisions. In Capgemini's 2009 survey of potential car buyers, 20% of U.S. respondents said that the environment was their primary reason for choosing a fuel-efficient or alternative-fuel vehicle, up from 9% the previous year (Capgemini, 2009). However, research on the electric vehicle market noted that the rising price of fuel is the main factor driving interest in electric vehicles, and while concerns about energy security and climate change are growing, they are not yet contributing to purchase behavior (Ernst and Young, 2010).

The results of Capgemini's 2007 survey indicated that older consumers are more likely than the younger consumers (defined as consumers 18-34 years of age) to identify fuel economy as a primary factor for purchasing a fuel-efficient or alternative-fuel vehicle. In addition, men are more likely than women to place an emphasis on fuel economy, while a higher proportion of women identified environmental impact as the primary reason for purchasing a green vehicle (Capgemini, 2007).

A Michigan State University study based on Deloitte's Generation Y survey data similarly found an emphasis on fuel economy. It found that miles per gallon, price and brand were determined to be the most important product attributes to the Gen Y consumer, with environmental concerns taking a secondary role (Deloitte/ MSU, 2010).

A 2008 Deloitte survey analyzing Generation Y's relationship with the automobile demonstrated that while gas mileage, price, and performance were rated the most important factors in the decision process, low emissions and production in an environmentally friendly factory were also rated as important factors. In addition,

Generation Y consumers rated environmental-friendliness as one of the top three reasons that a vehicle is cool, along with exterior styling and affordability (Deloitte, 2008). Deloitte's 2009 follow up survey indicated that 73% of respondents agree that the environment is an extremely important factor when purchasing a vehicle, while nearly half of respondents agree that the types of vehicles they drive directly affect the environment. Additionally, nearly 53% of respondents would pay more for an environmentally-friendly vehicle. Nearly 65% would pay more for a vehicle that is better for the environment and saves energy costs. But 45% would NOT pay more for a vehicle that did not save money on energy costs even if it was better for the environment (Deloitte, 2010). In short, a vehicle must provide both environmental and economical advantage to the Gen Y consumer.

Other studies support the idea that although there is a growing interest in green vehicles, cost is still an important issue. A 2009 survey of 3,000 car buyers in Brazil, China, France, Germany, India, Russia, the United Kingdom and United States found that consumers show some willingness to pay for improved fuel efficiency: 70% of respondents said they would pay no more than 10% extra for a fuel-efficient or alternative-fuel vehicle, and 20% were not willing to pay any premium at all (Capgemini, 2009a). Another study found that while a majority of U.S. drivers (52%) claim a preference for alternative fuel vehicles, only 28% would be willing to pay a premium for such vehicles. Most customers, it seems, do not feel that the savings at the pump are sufficient to offset the higher price of today's alternatively fueled vehicle (Deloitte, 2010).

One study estimates that a 10% core of possible electric vehicle early adopters has formed (Ernst and Young, 2010). A 2004 report on the then-emerging gasoline/electric hybrid estimated the natural market for gasoline/electric hybrids to be about 15% of the U.S. population, further noting that the key to sustainability of the green vehicle market is the ability to capture the more than "30 percent of the U.S. consumer market that is friendly to green products, but unwilling to give up much to embrace it" (Booz & Company Inc., 2004). In this sense, it appears that while there is increasing interest in going green, green vehicles, especially electric vehicles, are still considered to be a niche market.

b. Barriers to increasing market share of green vehicles

While much of the literature focuses on the commercial viability of electric vehicles, and indicates that electric vehicles will feature prominently in the long-term future of the green vehicle industry, there are numerous barriers to their widespread adoption. These barriers include lack of public awareness, price, need for specialized infrastructure, battery performance, and doubts concerning the electric car's ecological value. Despite growing interest in green vehicles, for there to be widespread adoption, green vehicles need to be seen as a "no compromise" alternative, in that their price and performance is at least on par with the traditional or "brown" vehicles available on the market (Booz & Company Inc., 2004).

Public awareness of emerging powertrain technologies is weak in the United States. Data from the Deloitte' Generation Y surveys revealed that on average, Generation Y consumers do not feel as though they are experts with respect to sustainable vehicle technology, and this absence of confidence may represent a significant barrier to adoption (Deloitte/MSU, 2010). Thirty percent of U.S. consumers are still unaware of hybrid/electric technologies even though those vehicles have been on the market for more than ten years. Further, few consumers are willing to embrace new technology prior to it being well established in the market (Ernst and Young, 2010).

A report by Price Waterhouse Coopers estimates electric vehicles to cost approximately $7,000 - $20,000 more than a traditional vehicle depending on the vehicle under consideration, with much of the premium attributed to battery cost (Price Waterhouse Cooper, 2009). Consumer research reveals some willingness to pay a higher upfront cost for an electric vehicle, if lower vehicle operating costs offset the higher upfront cost over time (The Boston Consulting Group, 2009). Another study found that consumers would accept a three-year amortization period for the price differential, but noted that under current cost conditions, electric vehicles do not come close to meeting this time horizon (Price Waterhouse Cooper, 2009). Other studies show that consumers would be willing to pay a premium of 10% for enhanced fuel efficiency (Capgemini, 2009a) and a 14% premium for an electric vehicle (Wyman, 2009). Some experts conclude that a combination of high fuel prices and government purchase incentives is needed for electric vehicles to make financial sense to the consumer (The Boston Consulting Group, 2009, 2010; Price Waterhouse Cooper, 2009; Capgemini,

2009b). Analysis by the Boston Consulting Group suggests that in order for U.S. electric car purchasers to break even in three years, one of three conditions would need to be met, alone or in combination: an oil price increase from $100 to $300 per barrel; a 200% increase in gasoline prices caused by higher oil prices, higher taxes, or both; or $7,500 in government incentives per car purchased (Boston Consulting Group, 2010).

Battery performance is another key barrier to widespread adoption of the electric vehicle. The current driving range of an electric vehicle is between 160 to 190 miles on a single charge, with battery recharge time of four to eight hours (The Boston Consulting Group, 2009, 2010). This insufficient driving range is viewed as a barrier to widespread commercial acceptance. A 2010 nationwide survey of 1,000 respondents of driving age (Ernst and Young, 2010) revealed that 33% of respondents have daily driving range expectations of more than 200 miles. Interestingly, the Ernst and Young survey revealed that respondents' driving range expectation is much higher than their actual daily miles driven. While 72% of respondents drive less than 30 miles per weekday, 87% of respondents expect electric vehicles to have a daily driving range of 50 – 200 miles (Ernst and Young, 2010). One study concludes that electric cars need to achieve a driving range of approximately 312 miles on a single charge (The Boston Consulting Group, 2010 – batteries for electric cars). Further, electric cars require a network of charging stations, which will be costly to build. Without the necessary infrastructure, drivers of electric vehicles will be restricted to short commutes (PriceWaterhouseCoopers, 2009a, 2009b; The Boston Consulting Group, 2009, 2010; Capgemini, 2009b). However, the 2010 nationwide consumer survey by Ernst and Young revealed some willingness to pay for the infrastructure necessary to support electric cars, with 34% of respondents saying that they are willing to help pay for charging stations to be installed in their communities (Ernst and Young, 2010).

Finally, there is some indication of doubt as to whether electric vehicles are truly "clean vehicles" because in some cases, the electricity used to power electric vehicles is generated by high polluting sources such as coal power plants (PriceWaterhouseCoopers, 2009; Capgemini, 2009b). Another potential area of concern is the environmental impact of recycling used batteries (Capgemini, 2009b).

c. Vehicle choice among green vehicles

Gas/electric hybrid vehicles such as the Toyota Prius are the primary type of advanced technology vehicles that consumers currently own or plan to buy. This is likely due to the fact that these cars have been on the market the longest, and they run on regular motor fuels and leverage existing infrastructure (Capgemini, 2009b; Booz & Company Inc., 2004). Further, gas-electric hybrids available on the market today are competitive in terms of style, as some manufacturers provide hybrid versions of traditional models. In addition, initial data indicate that hybrid reliability is on par with all-gasoline traditional models, and that the cost and resale value of hybrids is typically competitive with that of traditional models (Booz & Company Inc., 2004).

In Deloitte's 2009 survey of Generation Y consumers, respondents were asked to indicate which type of sustainable technologies would favorably impact their purchase. Standard gasoline engine with high fuel efficiency and hybrid gas/electric engines were citied most frequently (23% and 22% respectively). Alternative fuel vehicles (ethanol/gasoline engines and clean diesel engines) and electric vehicles were each selected by 12-13% of respondents. Slightly less than 7% said that sustainable technology does not affect their purchase decision in some way (Deloitte, 2010).

Consumer education is lacking with regard to available green vehicle technologies. It seems that consumers do not have the information needed to really understand the differences between vehicles to be able to make comparisons across brands and types of technology (Deloitte/MSU, 2010). Further, as described in the previous section, there are several drawbacks to the electric vehicles available on the market today that limit them from becoming a realistic choice for more than a dedicated group of early adopters.

5. Importance of Interactions with Customers

As the global auto industry struggles to deal with the economic downturn and American carmakers try to recuperate from a year full of bad news, maintaining a strong customer focus becomes essential for survival and good performance. As Accenture (2009) points out, the key to negotiating the changes in the present market, building customer loyalty and ensuring growth in the long-term, involves understanding the current customer base, experimenting

and expanding to newer customers, developing trust-based relationships with customers, and managing customer interactions and transactions efficiently.

Further, the role that manufacturers and dealers play in promoting fuel economy among customers is pivotal. Recent pre-group online surveys conducted by EPA in collaboration with PRR found that over of two-thirds of the respondents looked at manufacturers' websites to search for information on fuel economy. The surveys also showed that close to one-third (30%) searched for fuel economy information at automobile dealerships.

a. Customer satisfaction and loyalty

The previous sections in this literature review explored the vehicle buying process and the various vehicle-related demographic and psychographic factors that impact current and potential customer vehicle choice. This section explores the experiential factors that influence consumer loyalty to the dealer and/or brand, their satisfaction with the purchase, and their behavior after purchase.

With the world shrinking into a global village, the Internet becoming a passport to almost everywhere, and the offering of an assorted range of competing vehicles (models and makes) to choose from, consumers are becoming increasingly diverse with specialized needs and are more aware than ever of what vehicle they want to buy even before they enter the showroom (Capgemini, 2006a). The customer-dealer relationship has undergone drastic transformations in recent times. With customers having access to information about the vehicles under consideration, the new customer-dealer relationship model is more like an interaction between two equal parties. As Capgemini, (2006b) has pointed out, the final vehicle purchase decision is a result of a trust-based relationship where the dealer is not "selling" but instead enabling the customer to buy.

During the purchasing process, the customer-dealer relationship starts about two weeks before the final purchase when the customer visits the showroom (Capgemini, 2006b). During this entire customer-dealer interaction, the customer goes through various emotions; how well the dealer manages these emotions can impact the sale, the price a customer pays, and the reputation of the manufacturer. In its 2008 study, J.D. Power found that auto

consumers attach a great amount of importance to the quality of interaction with the dealer and are willing to pay a slightly higher price to the dealer who has highly professional staff and provides high-quality customer experience and services. Further, the study stated that consumers also read online reviews and rankings about other shoppers' experiences at the dealership and use these to determine what kind of experience they're going to have at a dealership (Root, 2008).

In addition to its direct implications (whether or not the customer buys the vehicle from that dealer), the customer-dealer relationship has far reaching impacts on customer satisfaction and their loyalty to a brand and/or manufacturer, which in turn affect brand and/or manufacturer reputation (Car Internet Research Program & Capgemini, 2008). As Oracle (2003) explained, a poor dealer experience can have a significant negative impact on brand perception. Conversely, those who have a good experience and feel satisfied are more likely to purchase the same make and/or brand from the same dealer in the future. In practice, this requires that dealers and manufacturers learn to understand the consumer's universe, the tools at their disposal, and the states of mind they are in when deciding to buy a vehicle (Capgemini, 2006b).

While previous analyses by Oracle (2003) and Capgemini (2006a, 2008) indicated that the automotive industry had been facing declining customer loyalty over time, a slightly more recent survey by Capgemini (2009a) found an increase in the number of consumers who have become brand and dealer loyal and that consumer satisfaction with the buying process has grown in the last year. The study attributed this increase to "contraction in the dealer business and improvements in quality and service resulting from investments in customer lifecycle management systems" (Capgemini, 2009a). In addition, the study pointed out that consumers are more loyal to the brand than to the dealer. A similar finding was reported in the Dohring Company National Automotive Consumer study (1996). The study was based on 1,253 respondents who were surveyed across the United States and found that more customers are likely to be loyal to a certain make of vehicle than to a dealership and that customers primarily associate their purchases with the automotive manufacturer rather than the particular dealer that they purchase from.

III. Consumer Education Campaigns Regarding Fuel Efficient Vehicles

A review of literature on the results of education campaigns used to encourage consumers to make more fuel efficient vehicle choices revealed the following. However, it should be noted that the literature review yielded little academic research evaluating the effectiveness of these educational campaigns.

A. Evaluation of Existing Consumer Education Campaigns

Some researchers question the effectiveness of focusing on fuel economy as a means to change consumer purchase decisions, instead supporting a focus on fuel efficiency and technological advances. A 2000 study (Plotkin, 2000) states that education programs on fuel economy have limited value when fuel prices are low, suggesting that it may be more effective for government-sponsored educational programs to encourage consumers to consider green technologies. Kurani and Turrentine (2004) concluded that current strategies of drawing attention to annual fuel cost savings could disappoint buyers, noting that the importance of fuel economy comes and goes in the minds of consumers as the price of gasoline or household income changes, or as individual drivers go through lifestyle changes, such as needing to drive more. The authors conclude that educational efforts that focus on fuel efficiency and technical advances may be more effective, that consumers "might value fuel economy more highly if it were more like shiny paint or a bold body style—an attribute with some emotional punch."

A 2008 graduate thesis (Bacani, 2008) looked at the effectiveness of Maine's Clean Car Program (described below) in improving the likelihood of ownership of vehicles with higher environmental performance. Bacani concluded that the campaign did not appear to be affecting consumer behavior with regard to purchase of environmentally-friendly vehicles, and that Maine consumers are buying more environmentally-friendly vehicles simply because there are more environmentally-friendly models available in the market. However, the study did not look at price, indicating a need for further research to verify results. The author suggests public education on the importance of the air pollution score and the greenhouse gas scores would be helpful when purchasing a vehicle.

B. Overview of Existing Social Campaigns Influencing Perceptions About Vehicles

Existing campaigns include:

- www.fueleconomy.gov

  Website provides fuel economy estimates, energy and environmental impact ratings, fuel savings tips, and links to other information such as links to fuel prices and crash ratings. The site also provides a side-by-side comparison tool to help consumers choose a fuel efficient vehicle to meet their needs. The website is maintained jointly by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy and the U.S. Environmental Protection Agency to help fulfill DOE and EPA's responsibility under the Energy Policy Act (EPAct) of 1992 to provide accurate MPG information to consumers.

- It All Adds Up to Cleaner Air, Federal Highway Administration, www.italladdsup.gov

  It All Adds Up to Cleaner Air is a public education and partnership-building initiative developed by several federal agencies including the Federal Highway Administration, Federal Transit Administration, and U.S. Environmental Protection Agency for the purpose of informing the public about the impact of their transportation choices on traffic congestion and air quality. The campaign was developed

to help state and local governments meet mobility and clean air goals of Transportation Equity Act for the 21st Century and the Clean Air Act Amendments. The campaign provides state and local agencies free commercial-quality promotional materials that emphasize four actions people can take to improve air quality and reduce traffic congestion: combining errands into a single car trip, keeping cars properly maintained, refueling in the evening without topping off the gas tank, and choosing alternate modes of transportation, such as carpooling, mass transit, biking, or walking.

- Planet Polluto,
  www.planetpolluto.com/index1.html

  Planet Polluto is an educational game developed by the Sacramento Metropolitan Air Quality Management District that teaches children about the causes and effects of pollution.

- Cleaner Cars for Maine Program,
  www.maine.gov/dep/air/lev4me/index.html

  The Cleaner Cars for Maine Program is designed to help consumers choose low-emission and fuel efficient cars. Program strategies include providing a sticker identifying green vehicles and consumer education in the form of a website, brochures, newspaper and radio advertising to educate consumers about Maine's air quality, green vehicle shopping tips, and maintenance tips.

- Pew Campaign for Fuel Efficiency,
  www.pewfuelefficiency.org/index.html

  The Pew Campaign for Fuel Efficiency is a public education campaign advocating greater fuel efficiency standards for the U.S. car and light truck fleets. The Campaign works with a diversity of interests — business, faith, consumer, environmental, safety and national security groups — to educate the public and inform the national policy debate. The campaign focuses on six reasons to increase fuel efficiency, including security, savings, power (the ability to increase fuel efficiency without sacrificing acceleration

and other measures of performance), jobs, safety (the ability to make cars more fuel efficient without sacrificing vehicle size or safety), and lower CO2 emissions. Strategies include extensive media outreach, national and local print and radio advertisements, and public opinion research.

- Drive Smarter Challenge Campaign, http://drivesmarterchallenge.org/

  The Drive Smarter Challenge Campaign is a program of the Alliance to Save Energy. The campaign provides a website that encourages people to learn about money-saving driving and vehicle maintenance tips and take the Drive Smarter Challenge by choosing from six fuel efficiency actions. The site provides a calculator that computes an individual's savings and keeps a running tally of savings by everyone who has taken the challenge and encourages people to get friends and family to take the challenge by offering discounts on fuel-efficient products.

- DriveClean.ca.gov, www.driveclean.ca.gov/

  DriveClean.ca.gov is an online buying guide for clean and efficient vehicles. The website, run by the California Air Resources Board, allows consumers to compare pollution levels between vehicles and provides information and resources to learn about advanced vehicle technologies and fuels. The program provides an Environmental Performance Label, a label required on all new cars sold in California manufactured after January 1, 2009. The label provides a global warming score, which ranks each vehicle's CO2-equivalent value on a scale of 1-10 (10 being the cleanest) relative to all other vehicles, and a smog score, which tells the consumer how much a vehicle pollutes. Similar to the global warming score, the smog score uses a scale of 1-10 with 10 being the cleanest.

- Don't Be Fueled! Mothers for Clean and Safe Vehicles, www.dontbefueled.org/index.shtml

  Don't Be Fueled! Is a grassroots campaign initiated by parents concerned about the safety and environmental soundness of the existing fleet of vehicles. The campaign has established a website that serves as an information clearinghouse and organizes events.

- Freedom From Oil, http://gx.freedomfromoil.org/

  The Freedom from Oil Campaign is a joint effort of the Rainforest Action Network, Global Exchange, and the Ruckus Society. The campaign is working to end America's oil dependence, reduce oil related conflicts, and stop global climate change by convincing the auto industry to dramatically improve fuel efficiency and eliminate vehicle greenhouse gas emissions. The campaign focuses on supporting grassroots activists by offering materials and information, skills training, local organizing, group development, and other general support.

IV. Summary of Results and Conclusions

The purpose of this literature review was to summarize the information on the vehicle buying cycle, the information sources used by consumers as they shop for vehicles, what factors influence consumer vehicle purchasing decisions, the impact of the increasing availability of "greener" vehicles, and information on available public education campaigns on the benefits of driving "greener" vehicles.

The sources used to prepare this literature review were varied in their methodologies and carried a variety of methodological limitations as to their coverage of the population of U.S. vehicle buyers. Attachment I provides a summary of each major source used and an explanation of its methodology and limitations. It should be noted that in spite of the multiple methods used by the major sources, a number of similar and consistent results and themes emerged from among them.

Based on the review, there are a number of key findings have implications for the redesign of the fuel economy label, as well as the educational campaign designed to aid consumers in identifying and choosing more fuel-efficient vehicles.

- The length of the vehicle buying cycle is contracting as consumers obtain more information sooner from the Internet. By the time U.S. consumers enter a dealership, they are closer to purchasing a vehicle than ever before. The Internet has emerged as one of the most important sources of information for consumers interested in purchasing a vehicle. To gather information they visit manufacturer and dealer Web sites and rely on consumer-to-consumer tools like reviews and blogs. Consumers are also increasingly

interested in purchasing vehicles online. Consequently, the information on the redesigned fuel economy label, which is intended to inform them about a vehicle's performance in regard to several metrics (such as fuel consumption, cost, and environmental impact), should also be available online.

- Considering that in the consumer surveys reviewed consumers consistently stated that the most important factors that influence vehicle choice are reliability, safety, price, and fuel economy (not necessarily in that order), the fuel economy label and educational campaign will need to acknowledge the place that fuel economy plays in the purchase process and identify ways to 'be heard' as consumers make their decisions.

- Consumer vehicle purchasing is also influenced by how a vehicle satisfies the practical and emotional needs of the consumer. Age, gender, income, household size, urban or suburban living, as well as availability of other travel options, all play a part in what type of vehicle a consumer decides to purchase, as do the psychographic aspects of 'what a vehicle says about me.' This suggests that to be most effective, the educational campaign should be tailored to specific demographic market segments, while also making the purchase of fuel-efficient vehicles a 'cool' statement about the consumer. Acknowledging what is important in the vehicle purchase process to specific demographic segments, as well as to what consumers' think of as 'cool', can serve as a gateway to getting their attention. Finally, demographic and psychographic influences not only help in understanding the appeal of particular vehicles, but also point the way towards potential messaging to assist consumers in identifying fuel-efficient vehicles.

- A major challenge will be explaining the functioning of advanced technology vehicles to consumers. Overall, consumers lack information on "green" vehicles and technologies to really understand the differences and be able to make comparisons across brands, models, and technologies. Identifying easy-to-understand ways to explain advanced technology vehicles, how they function, and the fuel efficiency of such vehicles will need to be

determined before an effective educational campaign can be designed. The redesigned fuel economy labels will be an important starting point for this since it is being designed to allow consumers to make informed comparisons among vehicle types.

- Lastly, the results of the literature regarding consumer education campaigns related to helping consumers better understand the benefits of purchasing a more environmentally friendly vehicle can serve as an important starting point for the agencies' educational campaign. Although it does not appear from the literature that these campaigns have evaluated outcomes, they can still provide good information, especially if key staff members from those campaigns are interviewed to learn about what worked and didn't work from their perspectives.

Attachment 1 - Summaries of Major Studies

Evidence from the Maine Light-Duty Vehicle Market: Are Eco-Campaigns Effective? was prepared by **Eleanor Santiago Bacani** in **2008** as a thesis for a Master of Science in Resource Economics and Policy at The University of Maine. The goal of the study was to investigate whether eco-marketing campaigns have been effective in improving the likelihood of ownership of vehicles with higher environmental performance, as well as looking at the effects of demographics and gas prices. The study focused on the light duty vehicle market in Maine. The researcher conducted regression analysis using data from the Maine Vehicle Registration Database between 2004 and 2007, data sets from EPA Green Vehicle Guides for model years 2004 to 2007 (to obtain environmental information), U.S. Census (town-level demographics), and gas price information. Results suggest that eco-marketing campaigns do not appear to have had a statistically significant effect on the likelihood of owning SUVs with higher environmental performance. In addition, the study found that households have differing reactions to the various pollutants associated with vehicles in some vehicle classes, suggesting that policy efforts should be directed at informing the general public of air pollution scores and greenhouse gas scores when purchasing a vehicle to maximize the effectiveness of future eco-marketing initiatives. The general conclusion is that the eco-composition of the light-duty vehicle market is improving over time because of the increased number of vehicle models with higher environmental performance that are available in the market today. The results of this study are only relevant to light-duty vehicles purchasers in Maine between 2004 and 2007, and the author stated that due to sufficient information the findings of this study would need further research to be validated. Regardless, it does provide a case study of how vehicle purchases are impacted by eco-marketing campaigns. These findings were used to support the discussion in this literature review report of existing consumer education campaigns.

Energy Trends: New Hybrids Breaking Out of the Niche? was prepared by **Booz & Company** in **2004**. The report is part of an occasional series highlighting emerging trends in the global energy sector. The report looks at the emergence of gasoline/electric hybrids in their infancy in 2004 and analyzes hurdles to broader market acceptance. The article concludes that if long wait times and premium prices persist, consumers will walk away from this new technology. In addition, new market entrants need to match the reliability and performance standards set by hybrid leaders Toyota and Honda. However, hybrids serve as one part of the long-term trend towards creation of a more efficient vehicle fleet. The results of this report provide information relevant to consumer vehicle purchasing decisions during the early emergence of gasoline/electric hybrid vehicles. The conclusions made in this report were used to support the discussion in this literature review report of barriers to increasing the market share of green vehicles.

Batteries for Electric Cars: Challenges, Opportunities, and the Outlook to 2020 was prepared by The **Boston Consulting Group** in **2010.** The paper looks at the impact of the development and cost of various types of batteries on the emerging market for electric cars, analyzing the amount of progress anticipated by 2020, and the barriers that will need to be overcome in order to achieve widespread commercial adoption of electric vehicles. The report draws on Boston Consulting Group's work with automotive OEMs (original equipment manufacturers) and suppliers and on a detailed analysis of the intellectual property landscape. The researchers also created a battery cost model to project future costs and conducted 50 interviews with battery suppliers, automotive OEMs, university researchers, start-up companies working on leading-edge battery technologies, and government agencies across Asia, the United States, and Western Europe. The paper concludes that long battery charging times are a technical challenge and commercial barrier that must be addressed and that without a major breakthrough in battery technologies, it is unlikely that fully electric vehicles that are as convenient as internal combustion engine vehicles (meaning that they can travel up to 500 km/312 miles on a single charge and can recharge in minutes) will be available for the mass market by 2020. Further, the paper concludes that the cost of batteries will play a critical role in determining the commercial viability of electric cars and that in the short- to medium-term, early adopters and government incentives are likely to drive demand for electric

vehicles. For mass market adoption, total cost of ownership becomes a factor. Consumers will weigh an electric vehicle's savings (generated by lower operating costs relative to gasoline) against the higher upfront purchase price. A combination of high fuel prices and government purchase incentives is needed for electric vehicles to make financial sense to the consumer. The findings in this report help explain the current and projected U.S. market for electric car batteries. The conclusions made in this paper were used to support the discussion in this literature review report of barriers to increasing the market share of green vehicles.

The Comeback of the Electric Car: How Real, How Soon and What Must Happen Next? was prepared by the **Boston Consulting Group** in **2009**. The paper evaluates the viability of available technologies for efficient, low-CO2 emitting power trains and presents a view on the most likely market scenarios for 2020, with a discussion of the implications for major stakeholders. The authors analyzed current scientific findings on energy consumption, oil reserves, and CO2 emissions, as well as technological options for alternative propulsion concepts in addition to interviewing OEMs, suppliers, battery manufacturers, power companies, and conducting consumer research. The report concludes that electric cars are a critical component of efforts to reduce CO2 emissions through increased vehicle efficiency, but a total cost of ownership advantage is a prerequisite for widespread adoption of electric vehicles. Without government incentives to encourage consumers to purchase electric vehicles and power companies and private investors to provide the infrastructure needed to support electric vehicles at an affordable price, electric vehicles will not succeed beyond serving a niche market. This paper represents the views of its authors on the electric car market based on a variety of sources based on varied methodologies. The conclusions in this paper were used to support the discussion in this literature review report of fuel-efficient/low emission vehicle options, and the barriers to increasing the market share of green vehicles.

Electric Vehicles: A Force for the Future was prepared by **Capgemini** in **2009**. The report explores challenges to widespread acceptance of the electric vehicle. An explanation of the methodology used to prepare this report is not provided. The report identifies challenges to widespread acceptance of the electric vehicle including battery performance, recharging infrastructure investment, market

acceptance, price, existence of other alternatives, ecological value, and technological maturity. The report concludes that collaboration is key to electric vehicle development, including vehicle manufacturers, suppliers, dealers, other retailers, consumers, electric/utility companies, and governments. The conclusions in this report were used to support the discussions in this literature review report of reasons for buying fuel efficient/low emission vehicles, barriers to increasing the market share of green vehicles, and vehicle choice among green vehicles.

Cars Online 05/06: Creating Opportunities for Revenue Growth and Cost Reduction was prepared by **Capgemini** in **2005**. The purpose of the study was to: 1) compare consumers' automotive needs, demands and preferences across the buying cycle; 2) explore the factors that drive automotive buying behavior and impact consumers' relationships with manufacturers and dealers; 3) address lead management, B2C web strategy and aftersales/servicing; and 4) examine the similarities and differences among the countries studied in order to provide a picture of the dynamics of individual markets. For this study, Capgemini surveyed almost 2,700 consumers via telephone in five countries: China, France, Germany, the United Kingdom and the United States. The composition of the consumer sample in each country was based on projectable national samples representative of the population from the standpoint of region, age and gender. Nearly all consumers surveyed were in-market—that is, intending to purchase or lease a new or used vehicle in the next 12 months. In addition, almost 230 dealer interviews were conducted in the five countries along with interviews at nearly 25 manufacturer headquarters or national sales offices. European, U.S. and Asian brands were represented among the consumers, dealers and manufacturers surveyed. Relevant main findings of the study included: consumers are becoming more sophisticated and are using the Internet to gain more information prior to purchasing new vehicles, and demographic differences are more significant especially between the youngest and oldest age groups of vehicle buyers in terms of what information they use to make purchasing decisions, how they obtain this information, and how they make their vehicle purchasing decisions. The study findings are based on a demographically representative sample of consumers planning to purchase a car within the next 12 months. While the results are informative, as they include information from countries besides the U.S., they are not exclusively representative

of the U.S. market. Regardless, the study does provide information on trends that is relevant as all countries (except China) are mature car purchasing populations. The findings in this study were used to support the discussion in this literature review report of the emergence of the web as an information source, the vehicle buying cycle, and how demographics impact vehicle purchasing decisions.

Cars Online 06/07: Understanding the Dynamics of Consumer Buying Behaviour and Customer Loyalty was prepared by **Capgemini** in **2006**. The purpose of the study was to: 1) explore the factors that drive automotive buying behavior and impact consumers' relationships with manufacturers and dealers, address lead management, B2C Web strategy and consumer loyalty, and examine the similarities and differences among studied countries to provide a picture of the dynamics of individual markets. For this study, Capgemini surveyed more than 2,600 consumers in five countries: China, France, Germany, the United Kingdom and the United States. The composition of the consumer sample in each country was based on projectable national samples representative of the population from the standpoint of region, age and gender. All consumers surveyed were in-market—that is, intending to purchase or lease a new or used vehicle in the next 18 months. The main findings of the study included: consumers are increasingly driven by their hearts as well as their heads when it comes to vehicle purchasing; customer loyalty is decreasing as consumers expect more information faster from manufacturers and dealerships; post-sales communications is important to repurchase of same brand and/or from same dealership; manufacturers and dealers need to work together closely to meet consumer needs; and vehicle buyers are using the web in a more targeted fashion. The study findings are based on a demographically representative sample of consumers planning to purchase a car within the next 18 months. While the results are informative, as they include information from countries besides the U.S., they are not exclusively representative of the U.S. market. Regardless, the study does provide information on trends that is relevant as all countries (except China) are mature car purchasing populations. The results from this study were used to support the discussion in this literature review report of the role of psychographics and the growing importance of the web in vehicles purchasing decisions.

Inside the Customer/Dealer Relationship: A Qualitative Study Examining the Shift of Power and the Influence of the Internet on the Vehicle Buying Process in Dealerships was prepared by **Capgemini** in **2006.** The purpose of the study was to provide a close-up look at the relationship between consumers and dealerships and how this relationship changes as consumers become better informed through use of the Internet. The study was directed at vehicles dealers to help them better prepare to serve better informed consumers. The study was based on qualitative research, consisting of observations and interviews with consumers and dealers, in both North America (U.S., Canada) and Europe (France, UK) at car dealerships representing 12 North American, European and Asian mid-market brands. This approach provided the opportunity to observe both what was said and what was done in order to understand behavioral trends and practices. The main findings of this study were: greater transparency is essential to improving the customer/dealer relationship because consumers have access to a seeming bottomless well of information from the Internet; the more knowledgeable consumers become about the vehicle buying process, the more the balance of power shifts in their favor; consumers increasingly demand a personalized and customized approach during the vehicle buying process; customers want to be seen as individuals, as people in their own right who cannot be reduced to a box in a grid; and the customer/dealer relationship is not a one-size-fits-all formula , it can vary considerably depending on a consumer's degree of advance knowledge. The results of this qualitative study are informative, as they include information from customers and dealers in the U.S., Canada, France, and the U.K., but are not representative of the U.S. market. Regardless, the study provides information on trends related to how consumers gather information to inform their vehicle purchasing decisions and consumer/dealer relationships in mature car purchasing countries. The findings from this study were used to support the discussion in this literature review report of how the Internet is being a more important source of information during the vehicle purchasing process.

Cars Online 07/08: Responding to Changing Consumer Trends and Buying Behaviour was prepared by **Capgemini** in **2007.** The purpose of the study was to provide insights to help vehicle manufacturers and dealers develop and execute more effective strategies in sales, marketing, advertising, aftersales service, customer relationship management, and manufacturer/dealer collaboration. For this study, Capgemini surveyed more than 2,600 consumers in five

countries: China, France, Germany, the United Kingdom and the United States. The composition of the consumer sample in each country was based on projectable national samples representative of the population from the standpoint of region, age and gender. All consumers surveyed were in-market—that is, intending to purchase or lease a new or used vehicle in the next 18 months. The main findings from this study include: consumer interest in online purchasing is growing as consumers become more sophisticated in use of the web; online tools such as search engines, blogs, and web forums are becoming key information sources for vehicle buyers; consumers are more interested in purchasing "green" vehicles; vehicle buyers want their information fast, if don't get it they will switch dealers, brands, or both; and personalized communications have a significant impact on repurchase decision. The study findings are based on a demographically representative sample of consumers planning to purchase a car within the next 18 months. While the results are informative, as they include information from countries besides the U.S., they are not exclusively representative of the U.S. market. Regardless, the study does provide great information on trends that is relevant as all countries (except China) are mature car purchasing populations. Information from this study was used to support discussion in this literature review report of the vehicle purchasing cycle, information sources and the use of the web in vehicle purchasing, how psychographics influence vehicle purchases, and other factors that influence vehicle purchase such as reliability, safety, price, and fuel economy.

Cars Online 08/09: 10th Annual Global Automotive Study: Tracking Consumer Buying Behavior in Both Mature and Emerging Markets was prepared by **Capgemini** in **2008**. The purpose of the study was to provide automotive manufacturers and dealers with insights into changing consumer dynamics in both mature and developing markets, and to help the industry gain a better understanding of how to successfully anticipate evolving consumer needs and demands. The study was based on a survey of more than 3,100 consumers in eight countries: Brazil, China, France, Germany, India, Russia, the United Kingdom and the United States. The composition of the consumer sample in each country was based on projectable national samples representative of the population from the standpoint of region, age and gender. All consumers surveyed were in-market (20% plan to buy or lease a vehicle within three months; 25% in three to six months; 40% in

six to 12 months; and 15% in 12 to 18 months). The main findings of the study included: fuel economy is as important a factor in a consumer's choice of vehicle as are safety and reliability; consumers' demand for online vehicle buying continues to grow (in 2008, 44% of consumers said they were likely or very likely to purchase a car entirely over the Internet if that capability were available, up from 20% the previous year); consumers are confident in their knowledge about green vehicles and are increasingly likely to own fuel efficient and alternative-fuel cars, although consumers are not prepared to pay a high premium to go green - 85% of respondents expect to pay less than 10% extra for a fuel-efficient or alternative-fuel car; consumers are increasingly demanding about the speed of response they expect from dealers and manufacturers; most consumers are satisfied with the vehicle buying process, but they see plenty of room for improvement; and consumers said that less haggling and pressure by dealer salespeople would increase their vehicle buying satisfaction level. The study findings are based on a demographically representative sample of consumers planning to purchase a car within the next 18 months. While the results are informative, as they include information from countries besides the U.S., they are not exclusively representative of the U.S. market. Regardless, the study does provide great information on trends in car purchasing behaviors. Study results were split out between those for mature and those for emerging markets. Those mature market results were used to support the discussion in this literature review report of the growing importance of the Internet in vehicle purchasing decisions, and the reasons for buying green vehicles.

Cars Online 09/10: Understanding Consumer Buying Behavior in a Volatile Market was prepared by **Capgemini** in **2009**. The purpose of the study was to look at online buying of vehicles and parts/accessories, alternative-fuel vehicles, and aftersales/servicing. The study also looked at what consumers saw as the biggest changes they expect to make in how they shop for and buy vehicles in the coming years. The study was based on a survey of more than 3,000 consumers in eight countries: Brazil, China, France, Germany, India, Russia, the United Kingdom, and the United States. The composition of the consumer sample in each country was based on projectable national samples representative of the population in terms of region, age and gender. All consumers surveyed were in-market (24% plan to buy or lease a vehicle within three months; 29% in four to six months; 11% in seven to nine

months; and 36% in 10 to 12 months). The main findings of the study relevant to this literature review were: usage of the web as a key information source during the vehicle buying process continues to increase with almost 90% of consumers today (2009) using the Internet to research vehicles, up from 61% in 2005; consumers want to buy vehicles and parts and accessories online due to lower prices and an alternative to the traditional dealer model with nearly 40% of respondents saying they would like to buy a car over the Internet; green vehicle ownership continues to rise as environmental concerns grow, with 41% of consumers saying they currently own a fuel-efficient or alternative-fuel vehicle, up from 36% the year before, and another 30% saying they plan to buy a fuel-efficient or alternative-fuel vehicle; as the duration of the vehicle buying cycle contracts, automotive companies have less time to influence purchases as consumers can quickly and easily get vast amounts of information from the Internet; and a number of indicators point to a growing desire for improved ease and speed of transaction, consumers expect a dealer to be responsive and almost one-quarter of respondents point to ease and speed of transaction as the key reason for buying a vehicle online, and 30% say it is the driving factor behind their desire to purchase parts and accessories over the web. The study findings are based on a demographically representative sample of consumers planning to purchase a car within the next 18 months. While the results are informative, as they include information from countries besides the U.S., they are not exclusively representative of the U.S. market. Regardless, the study does provide great information on trends in car purchasing behaviors. The results of this study were used to support the discussion in this literature review report of the growing importance of the Internet in vehicle purchasing, the vehicle buying cycle, the reasons for buying green vehicles.

The Relationship of Vehicle Type Choice to Personality, Lifestyle, Attitudinal, and Demographic Variable was prepared by **Choo and Mokhtarian** in **2002**. The purpose of the study was to explore how travel attitude, personality, lifestyle, and mobility impact individual vehicle type choices. The data is based on a 1998 mail-out/mail-back- survey of 1,904 residents of three different neighborhoods in the San Francisco Bay area representing suburban and urban areas. Based on the data, the authors developed a disaggregate discrete choice model to be able to estimate the effect of key variables on the probability of choosing vehicle types. The model

determined that specific vehicle types have distinct characteristics with respect to travel attitude, personality and lifestyle. Based on their research, the authors concluded that in addition to traditional demographics, travel attitude, personality, lifestyle, and mobility factors have significant impact on individual's vehicles type choices. The findings of this study are based on the three neighborhoods surveyed in the San Francisco Bay area, and are therefore not representative of the U.S. populations as a whole. Regardless, the researchers carefully selected these three neighborhoods to be representative of countless other similar neighborhoods in the U.S. These findings provide relevant information on how demographics influence vehicle choices. These findings were used to support the discussion in this literature review report of how psychographics impact vehicle purchasing choices.

Automotive Gen Y Survey Findings was prepared by **Deloitte** in **2008**. The goal of the study was to report findings from the Connecting with Gen Y: Making Cars Cool Again survey. It provides information to prepare the auto industry for Generation Y by shedding insight into what captured the automotive imagination of this dynamic age group. The information was based on a survey administered to a randomly drawn panel of 1,006 individuals in the U.S. between the ages of 17 and 28 who had previously agreed to participate in online surveys. The sample was evenly dispersed across geographic regions. The main findings included:

- Safety and comfort were the most important considerations for the Gen Y respondents when choosing cars. Gas mileage, price, and performance were the most important factors in the purchase decision. The factors named most often as among the top three reasons that a vehicle was cool were exterior styling (44%), affordability (40%) and being environmentally friendly (35%).

- Almost two-thirds (63%) perceived the cost of a vehicle as an indicator of quality.

- Close to half (49%) of respondents preferred foreign vehicle brands, compared to only one-quarter who preferred U.S. brands.

- Over one-fourth (27%) said that they expected to be driving the same brand in five years and stated that their current brand had a range of models to accommodate their future needs and that it was affordable. Another 27% said that they did not expect to be driving the same brand and stated that their current vehicle was all they could afford or that it had been given to them. Further, 45% reported that they were not sure whether they would be driving the same brand, and stated that the decision would depend on their personal finances, their lifestyle, and the available incentives.

- The majority (80%) said they are willing to pay more for a car that is environmentally friendly. Of those, 62% also viewed vehicles produced in an environmentally friendly factory as a determining factor in their decision.

These findings are not representative of U.S. population since the survey was administered to online panel members between the ages of 17 and 28 who had agreed to participate in such online surveys. However, the results were used to support the discussion in this literature review report of those factors that impact vehicle purchasing such as price, fuel economy, demographics, psychographics, and the reasons for buying green vehicles.

Connecting with Gen Y Making the Short List was prepared by **Deloitte** in **2010** as a follow-up to **Connecting with Gen Y: Making Cars Cool Again.** The goal of this study was to take a deeper look at Generation Y's attitudes and perceptions of vehicles and the auto industry. It was based on a survey administered to a randomly drawn panel of 1,100 individuals in the U.S., between the ages of 18 and 30, who had previously agreed to participate in online survey. The main findings included:

- Gas mileage and vehicle affordability emerged as the most important considerations for the Gen Y respondents purchasing cars.

- Over 63% believed that used vehicles were a greater value than new vehicles and they were more than three times as likely to purchase a used vehicle over a new one.

- Over half (53%) stated it was important that the vehicle be manufactured in an American factory no matter what brand it was.

- Over two-fifths (42%) reported they expected to be driving the same vehicle brand five years later. This was a 15% increase in brand loyalty from 2008 wherein only 27% indicated that they expected to be driving the same brand five years later.

- Over three-fifths (64%) stated that they were willing to pay more for a vehicle that was environmentally friendly and saves money on energy costs. Close to three-fourths (73%) reported that the environment was an extremely important factor when purchasing a vehicle. Half (50%) believed that the type of vehicle they drove directly affected the environment.

- Close to three-fifths (58%) reported that they did not look for advice or information on blogs or social media forums before purchasing a vehicle. Further, over three-fifths (64%) reported that they did not look for information about a brand or model on social networking sites (such as Facebook, etc.) when shopping for a vehicle. Instead, the majority (80%) tended to turn to on-line search engines (Google or Yahoo!) to search for information on vehicles and they trusted auto manufacturers' sites the most.

- Over three-fifths (62%) reported that they preferred the 'no haggle' method when purchasing a vehicle. The majority (85%) reported that they would prefer to know the final selling price upfront (by eliminating vehicle incentives from the vehicle purchase equation) and more than 60% stated they would prefer to skip pricing negotiations altogether with a salesperson. Additionally, they indicated that they would prefer to get the information they need over the Internet from the dealer rather than having face-to-face conversations with salespeople.

These findings are not representative of U.S. population since the survey was administered to online panel members between the ages of 18 and 30 who had agreed to participate in such online surveys. However, the results were used to support the discussion in this literature review report of those factors that impact vehicle purchasing such as price, fuel economy, demographics, psychographics, and the reasons for buying green vehicles.

Gen Y + Sustainability was written by **Michigan State University** in collaboration with **Deloitte** in **2010**. The goal of the paper was to provide an understanding of Gen Y's understanding of sustainable technologies, the degree to which Gen Y cares about sustainability and if they are willing to pay to embrace these ideas, and the "perceived monetary value" of these sustainable technologies. The paper used data from the 2009 Deloitte Automotive Group Generation Y Survey, focus groups and conjoint analysis (conducted on a nationally-representative sample of 200 Gen Y respondents) to explain Gen Y's "green" mindset. The main takeaways from this paper were: Gen Y is becoming more stable and homogenous as it matures into adulthood (as against the popular belief that Gen Y is thought of as autonomous and highly individualistic); educating consumers and communicating common industry wide sustainability standards is paramount for the auto industry (Gen Y lacked clear understanding of the different types of "clean" energy); Gen Y's value of sustainability and green technologies is tied to dollar savings (both environmental and economic advantage must be communicated whereby environmental logic must have economic logic as its backbone); and MPG is not a sustainable differentiator of value proposition to differentiate between vehicles (small MPG differences between vehicles were of little value to consumers).

These findings are not representative of U.S. population since Deloitte's survey was administered to online panel members between the ages of 18 and 30 who had agreed to participate in such online surveys. The conclusions in this study were used to support the discussion in this literature review report of the role of demographics in vehicle choice, reasons for buying green vehicles, barriers to increasing market share of green vehicles, and vehicle choice among green vehicles.

A New Era: Accelerating Toward 2020 – An Automotive Industry Transformed was prepared by **Deloitte** in **2009**. The goal of the report was to offer Deloitte Touche Tohmatsu's (DTT) senior automotive leaders' perspectives on the structural changes and major customer, technology, and people trends expected to transform the auto industry over the next decade. The report highlighted the following trends in the U.S.:

- The United States is one of the six markets (others are Western Europe, Japan, Korea, China and India) that will dominate as the center of design and manufacturing for original equipment manufacturers and their suppliers.
- U.S. auto consumers will be more cost conscious and will look for value of money and safety as the most important features.
- The median age of the population in United States will go up and car manufacturers will need to address the changing priorities of older drivers in order to remain competitive.
- Environmental considerations will weigh heavily on the auto industry toward 2020 and there will be a fierce competition to develop and produce electric vehicles spurred by both customer demand and government incentives.

This report represents the views of Deloitte's automotive practice based on their work and experience in the field. The conclusions in this report were used to support the discussion in this literature review report of the vehicle buying cycle, how safety impacts vehicle choices, fuel-efficient/low emissions vehicle options, and reasons for buying green vehicles.

Gauging Interest for Plug-In Hybrid and Electric Vehicles in the US was prepared by **Ernst and Young** in **2010**. The goal of the survey is to understand consumer awareness of electric vehicle technologies and reveal the factors that may influence them to purchase an electric vehicle. The survey was conducted with 1,000 U.S. licensed drivers across all 50 states. The survey found that public awareness of emerging powertrain technology remains very weak across the United States, and the rising price of fuel is the main factor driving interest

in electric vehicles, with concerns about energy security and climate change growing in importance. The largest concerns in purchasing an electric vehicle are vehicle cost and driving and battery range, although most consumers do not need to cover long distances regularly. These findings may not be representative of U.S. licensed drivers since the report does not clearly indicate how the sample was drawn. They were used to support the discussion in this literature review report of the reasons for buying fuel efficient/low emission vehicles, and barriers to increasing the market share of green vehicles.

Evaluating the Consumer Response to Fuel Economy: A Review of Literature was prepared by **Helfand and Wolverton** in **2009**. The purposed of report was to review literature on the role of fuel economy in consumer's vehicle purchasing decisions, review consumer vehicle choice models focusing on the role of fuel economy, examine consumer and producer behavior in the market for fuel economy, and assess the potential contributions of consumer vehicle choice modeling to regulatory analysis. The main findings of the literature review were: consumer vehicle choice models can used to help estimate how regulatory changes will impact consumer behavior, however, the literature review also noted the wide variance in these models on the value consumers place on fuel economy; consumers continue to under-value energy efficiency; producers appear to provide less fuel economy than consumers are willing to buy; and while consumers pay attention to fuel economy when they purchase vehicles, there is more to learn about how to model the role of fuel economy in consumers' decisions. The results of the study were based on the authors' review of relevant literature on fuel economy and vehicle choice models. The findings from this literature review were used in this literature review report to support the discussion of how fuel economy impact vehicle purchasing decisions.

Providing Consumers with Web-Based Information on the Environmental Effects of Automobiles was prepared by **Nye, Greene, Hopson, and Saulsbury** in **2003**. Findings are based on focus groups conducted in Knoxville, TN and Los Angeles, CA with seven to ten participants per group and lasting two hours. The focus groups were comprised of respondents between 18 and 64 years of age who (1) gathered information using the Internet, (2) participated in one or more "environmentally friendly" activities, and (3) were in the market for a new or used vehicle within 6 months. The purpose of the focus groups was to explore and understand how participants responded

to the different ratings and measurements of environmental effects provided by four websites: www.fueleconomy.gov, www.epa.gov/greenvehicles, American Council for and Energy Efficient Economy (ACEEE) www.greencars.com, and California Air Resources Board (CARB), www.arb.ca.gov/msprog/ccbg/ccbg.htm (California group only). Participants were asked to view websites prior to the focus group. The focus groups revealed that while participants in both cities understood some of the environmental effects of producing and operating automobiles, they rarely factored these effects into the decision process when purchasing a new or used vehicle and until consumers understand that the environmental effects are issues that affect them personally (such as safety or cost of fuel) they are not as likely to factor environmental concerns into the buying equation. Most participants would prefer some kind of overall environmental score that they could trust, and that would be applicable across the country and across all vehicles. There was a great deal of skepticism about the motives and actions of the government, auto manufacturers and auto dealers. Participants would use environmental information if it were readily available (where they normally go for information, such as Consumer Reports or other automotive magazines). Website content is important, but needs to be simple and quickly accessible, i.e., each number or rating system should be fully explained within the chart or on the same page. Focus groups provide qualitative data based on a structured set of questions. The results become meaningful when participants in multiple groups do or do not come to similar conclusions. Focus group results can be used to provide qualitative insights on particular issues and can not be used to represent the views of a larger population demographic and geographic area. The conclusions of these focus groups were used to support the discussion in this literature review report of the reasons for buying fuel efficient/low emission vehicles.

Capitalizing on Change: The Electric Future of the Automotive Industry was prepared by **Price Waterhouse Coopers Automotive Practice** in **2009**. The report is part of the Global Automotive Perspectives services, which provides an industry analysis of top-of-mind issues facing automotive executives. The report analyzes the impact of electric vehicles on the automotive industry. The report identifies several challenges that may slow and/or impede the market penetration of electric vehicles, including limited driving ranges, lengthy battery charge times, inadequate infrastructure (lack of charging station network), and higher upfront costs. The

report concludes that short-term gains from incentives combined with strategic large-scale investment are required to make electric powertrains a viable consumer option and achieve effective cost competition with traditional powertrain technology. Current business models will adapt to the change, with fleets being the likely wide-scale introductory channel. This report is based on the work and experience of the PriceWaterhouseCoopers Automotive practice, and represents the views of the authors. Its conclusions were used to support the discussion in this literature review report of the barriers to increasing the market share of green vehicles.

Technologies and Policies for Controlling Greenhouse Gas Emissions from the U.S. Automobile and Light Truck Fleet was prepared by **Steve Plotkin** of the Center for Transportation Research at the Argonne National Laboratory. The paper focuses on policies and technologies for increasing vehicle energy efficiency, with a focus on the light-duty vehicle fleet. The report concludes that while it is technologically feasible to improve the fuel efficiency of the U.S. auto and light vehicle truck fleets, many of the available technologies require trade-offs that manufacturers are unwilling to or unable to meet in today's market and regulatory environment. The efficiency of the light-duty vehicle fleet will remain essentially stagnant over time in the absence of an unforeseen change in market conditions or strong new policy measures, such as more stringent CAFE standards, significantly higher gasoline taxes, or gasoline price increased caused by sustained increases in world oil prices. This paper represents the author's interpretation of a variety of industry and academic sources on this subject. The author's conclusions were used to support the discussion in this literature review report of existing consumer education campaigns.

Automobile Buyer Decisions about Fuel Economy and Fuel Efficiency was prepared by **Turrentine and Kurani** in **2004**. The methodology used for this study was semi-structured interviews with 57 households across nine lifestyle sectors, such as hybrid vehicle buyers, financial analysts, and off-road enthusiasts. The strongest finding from the interviews was that consumers do pay attention to the price of fuel on the day they buy it, but do not consider the costs of fuel over time. Households interviewed were unable to determine the potential fuel savings of buying a more fuel efficient vehicle and in most cases overestimated the potential savings thinking they could recover an investment of several thousands dollars in

a couple of years. The authors offer two hypotheses: 1) consumers do not pay attention to fuel costs because of the low price of fuel and the limited fuel consumption instrumentation; and 2) vehicles carry too many other attributes of high value to consumers which minimizes the value of fuel efficiency. Overall, the authors conclude that consumers do not behave in economic rational way in regards to fuel economy. They lack the basic building blocks needed to make calculated decision about better fuel economy because they do not keep track of fuel costs over time, and do not make vehicle purchasing decisions based on potential payback from better fuel economy. The results of this study are attributable only to the 57 interviewed households. They become meaningful and interesting when the findings become consistent across multiple households and lifestyle sectors. For our purposes, the results provide an interesting case study on how households think about fuel economy and their own use and the cost of fuel. The study findings were used to support the discussion in this literature report of the role of fuel economy in vehicle purchasing decisions.

Car Buyers and Fuel Economy? was prepared by **Turrentine and Kurani** in **2006**. The goal of the study was to investigate how U.S. consumers thought and behaved with respect to automotive fuel economy. It was based on the same information used for their 2004 study (see above) - Automobile Buyer Decisions about Fuel Economy and Fuel Efficiency. The main findings were that none of the households analyzed their fuel costs in a systematic way in their automobile or gasoline purchases, and almost none of the households tracked gasoline costs over time or considered them explicitly in household budgets. While many of the households knew the cost of their last tank of gasoline and the unit price of gasoline on that day, they rapidly forgot such accurate information and replaced it with typical information. Such loss of information resulted in the lack of basic knowledge needed to make economically rational decisions while buying a vehicle. As a result, they made large errors estimating gasoline costs and savings over time. In addition, the study found that consumers valued fuel economy not only from the cost savings perspective but also attached symbolic value to it. The paper is based the results of the Turrentine and Kurani 2004 study described above and is subject to the same limitations. The conclusions of this paper were used to support the discussion in this literature report of how fuel economy impacts vehicle purchasing decisions.

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